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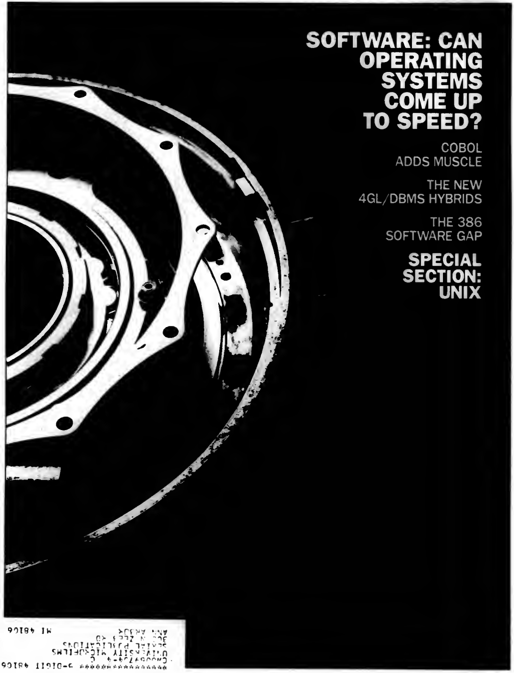

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SPECIAL SECTION: UNIX

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F 100 ENGINE COURTESY U S AIR FORCE, 1ST TACTICAL FIGHTER WING

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ON AT&T'S "HIGHWAY 3B" THERE ARE NO LIMITS ON WHERE YOU CAN GO WITH COMPUTERS.

Like it or not, the multi-system environment is here to stay. Mainframes will be mainframes. PCs will continue to proliferate like mosquitoes. And user needs will change every day.

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AT&T's 3Bs are easily linked *up* to IBM* mainframes and *down* to any combination of terminals, peripherals, and MS-DOS** PCs. The idea is to open communication between

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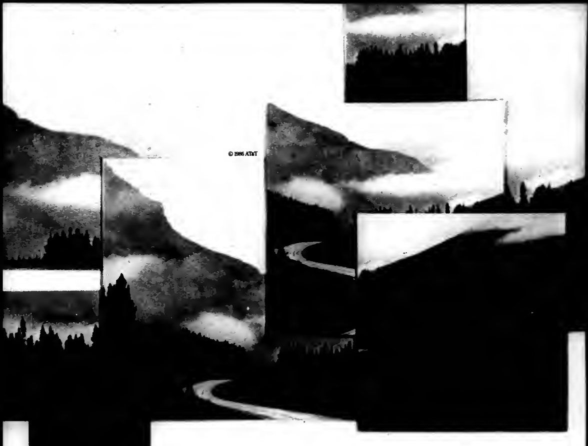

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systems—without forcing users to give up the applications they know and trust.

In most offices, the effect on productivity is electric.

"THESE GUYS THINK OF EVERYTHING."

The 3B's role in a distributed data processing environment can grow and change as your business evolves. For starters, UNIX™ System V permits the same software to run on a variety of machines, protecting your investment in applications and user training.

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WHERE ARE YOU GOING?

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the Art of Visual COBOL

COBOL programming has just been elevated to an art form thanks to Visual COBOL from mbp. This comprehensive COBOL compiler package gives you mainframe screen management capabilities for your IBM PC. As a result, Visual COBOL turns your color display into a canvas on which you can create professional data entry screens and a very visual user interface.

The heart of Visual COBOL is an interactive mask editor that encourages an artistic approach to screen design. By extending ANSI standards and providing full text editing capabilities, Visual COBOL allows you to create your own masterpiece using a full palette of foreground and background colors. You can easily move, insert, or delete fields; create an unlimited number of windows; even add eye-catching screen animation. In addition, Visual COBOL provides program-controlled video attributes for changing I/O field definitions in real time.

Once you add the final touches to your screen design, the mask editor automatically preserves your work of art in a separate screen library. At the same time, a WORKING-STORAGE definition is created for your mask. It's that simple.

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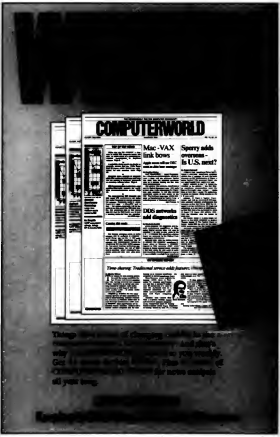
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SOFTWARE VIEWPOINT

EDITORIAL

The Sad State Of Operating Systems

Software has always lagged behind hardware advances but now it appears to be in a worse state than ever before. This can be seen in what is often termed "the sad state of operating systems."

Some advances have occurred in functionality and integration among operating systems and a few silver linings are appearing on the cloudy horizon, but for the most part, operating systems are not helping hardware fulfill its potential.

Operating systems today consist of systems that have come out of the data center days or that were once programmer tools known for their unfriendly interfaces. The Microsoft Corp. MS-DOS operating system is far from being a new operating system anymore because advances in hardware have outstripped it of lots of its power. MS-DOS is also now hampered by being a single-user system in today's multiuser world. In terms of new operating systems, we are still waiting for MS-DOS 5.0 to debut, but that eventuality seems to be pushed back further and further.

Yet the operating system picture is not all dark. Existing operating systems have evolved, merged and increased in sophistication and do, in fact, offer MIS managers increased options. Although many consider operating systems an invisible part of any system, it is worthwhile for MIS to take the time to study the changes going on in these engines that propel their systems. Many operating systems offer functionalities that can be used to improve the advantage of existing equipment. It would pay most MIS managers to become more aware of their advantages and disadvantages.

Many of these options and changes are outlined in this issue. Cobol is gaining new muscle, and senior editor Stan Kolodziej delves into this resurgence in "Cobol Shapes Up." The pros and cons of merging different operating systems is explored by features editor Michael Tucker in his story "Magnificent Monsters, Fabulous Hybrids." And the latest events in the Unix world are featured in our Special Section stories, which include a look at Unix and MS-DOS merge products that combine flexibility and user-friendliness. We also analyze the problems with the new Intel Corp. 80386 machines, problems rooted in their less capable operating systems.

MIS's role has been to balance technological realities with the demands from management and clients for more functionality. Until operating systems come fully up to speed, MIS will continue to juggle those elements in the near future.

Ann Dooley

LETTERS

Remember To Calculate Current Technology Cost

I am writing in response to Jim Young's article, "DP Managers Must Forecast the Future," in the August 20, 1986 issue of *Computerworld Focus*.

His article provides superior and philosophical reading for *any* manager who can appreciate the role of forecasting in decision making. However, one point needs a little more elaboration in practical terms. Young wrote: "Forecasting may guide a choice between alternatives or even encourage a strategic postponement of immediate action." I agree. But this may suggest to procrastinate without a complete cost/benefit study!

I think that the article would have been a little more detailed if it underlined that a DP manager must calculate the cost of available, expandable and upgradeable technology immediately, calculate the cost of postponement, evaluate the difference and decide what will be best for the company in the short and long term.

Incidently, here is some news that might interest Young and his Unix friends: A few friends and professional peers in Pakistan who are either using Unix (only a handful) or are otherwise interested in developing their understanding of it (like myself) meet informally every alternate day. We are formally launching a Unix Group in Pakistan on Jan. 3, 1987 at a Holiday Inn here. Any ideas and suggestions?

Usman A. Ghani
Sindhi Muslim Housing Society
Pakistan

Simple Solutions For Business Users On Mac

I am responding to the article in your Nov. 12, 1986 issue titled "Apple Plugs Into IBM's Market" and to a host of other articles addressing the end-user computing audience.

I have spent the majority of my 20 years of work experience addressing the user market, tuning in on its needs. The message that comes through strong and clear is: "Give me a solution to my problem, but don't make it more complex than the original area of concern."

Among the potpourri of so-called end-user products and services that flood the marketplace, one stands out, in my opinion, as having clearly met that expectation — namely, the Apple Computer, Inc. Macintosh Plus and its software. Yet this product continues to fight an uphill battle for recognition and acceptance as a business tool.

Your article quoted a gentleman as saying, "You can learn it in 10 minutes, but in 10 years you won't get any better." Isn't that precisely our goal? From an end-user's point of view, when I buy a PC to solve a problem today, I want it to be up and running as soon as possible. I don't want to spend the next 10 years learning all it can do for me. The Mac allows me to get to the root of the problem quickly and its solution, without needing to be a systems analyst. In short, the Macintosh is a transparent solution to end-user computing problems better than anything else on the market today.

Addressing the issue of incompatibility with the IBM world, I think the issue lies more with the application packages than with the hardware.

Although this reply may sound like a Macintosh ad, it is the result of a long run of frustration reading about solutions to end-user problems that end up causing more problems than benefits. When a product or service finally arrives on the market that does not appear to follow the pack, I think it deserves proper attention.

A. Charles Spina,
President,
Knowledge Resources
Information Counseling &
Research Services
Succasunna, N.J.

Graduate Urges Gearing Studies To 'Real World'

In its issues, *Computerworld Focus* appeals to its readers for thoughts, suggestions and ideas for future editions of the publication. I would like to recommend that *CW Focus* take a serious look at current educational trends.

I am about to graduate from a university in Virginia and feel that I know less than I did when I started. I received a broad-based education but it stopped short of much-needed practical experience and hands-on training. The classified ads are full of demands for people who have completed at least two years of experience in [computer] languages that I have barely heard of, much less know anything about. I feel that more could be done by educational facilities to better prepare graduates for the demands of the real world. I would enjoy learning more about how industry, as well as colleges and universities around the country, feel about this situation.

Kevin P. Kilpatrick
Fairfax, Va.

Attention Readers

Computerworld Focus will be published 12 times in 1987. We welcome letters to the editor and publish those we judge to be of interest to our readers. Letters may be edited for brevity.

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IT'S GOT SPEED! IT'S GOT MEMORY! IT'S GOT VERSATILITY!

SOFTWARE VIEWPOINT

The Market Heyday Of Operating Systems Is Nearly Over

INSIDER

Timothy J. Caffrey

For the past several years, operating systems have stepped from technical obscurity into the industry spotlight. However, this broadly defined collection of system utilities has had its day in the sun.

The evidence of the prominence these systems have held is abundant. For example, at the height of its power, Unix commanded the focus of at least one industry research house (Yates Ventures, Inc.) and stood as the central theme of AT&T's computer marketing strategy. Microsoft Corp.'s MS-DOS, perhaps the most successful off-the-shelf operating system, has been credited with opening up the IBM Personal Computer market to the now-ubiquitous clone. And, at the other end of the systems scale, a large part of IBM's marketing energies have been focused on the development and promulgation of a statement of direction for its mainframe operating systems.

Psychological, technical and financial investments in operating systems have been significant. Major planning decisions rest on the view of operating systems as central determinants of market direction. Systems planners, for example, have readily adopted standard operating systems for corporate computing.

Market strategists have spent valuable resources understanding the impact and direction of the Unix or MS-DOS.

Risk of missing the mark

Such market plans, however, involve considerable risk of missing the mark. The days of the operating system as a central market force are fast coming to a close. The shift from operating system to operating environment is more than a semantic subtlety.

The reasons for the coming decline of the operating system are firmly rooted in the myths that fueled its rise to prominence. The idea that a standard operating system exists was the first myth to crumble. Unix, in particular, promised an escape from the quasi-monopoly pricing of large systems and independence from proprietary operating systems. However, the market reality failed to deliver on either of these promises.

Another factor in the decline of the operating system is that it plays only a minor role in cross-systems networking and connectivity. While standardization on operating systems was seen as a cornerstone of connectivity, communications standards such as IBM's Document Content Architecture, Document Interchange Architecture, SQL and others have emerged as the real components of successful networking strategies.

Psychological weaknesses

Ultimately, however, the decline of the operating system will be attributed to psychological rather than technical weaknesses. Operating systems have little inherent appeal to the upcoming generation of market makers. As computing strategies are dictated increasingly by nontechnical buyers and users, these systems will step back into obscurity.

These changes do not mean that operating systems are going away. What is really happening is that our operating system definition is becoming outmoded. New, small-systems architectures, particularly those based on the Intel Corp. 80386, will incorporate the use of both hardware and firmware as the delivery vehicles for operating system functions.

At the same time, the size of the operating system portfolio is expanding to encompass communications, interface, graphics and a host of other now-separate systems utilities. The emergence of an applications platform will have a long-term impact on vendor strategies, market and product definitions and configuration options. Strategic thinking should be adjusted accordingly.

Caffrey is vice-president of Office Automation Services at Internotionol Data Corp. in *Framingham, Mass.*

A Guide To Mastering Your Operating System's Potential

MANAGER'S CORNER

Jim Young

MIS's choice of operating systems is many times a fallout of another decision like application software or hardware selection. While we cannot necessarily change how we acquire operating systems, at least we should do a better job of using the tools that we end up with.

Even when certain MIS managers inherit good operating systems, they either take the systems for granted and do not learn their full functions or these managers fail to see the need for features they only recognize vaguely.

It is easy to identify a manager of this ilk. He is the one who must ask outside experts if the system is out of capacity. He is the person who has machine performance problems and can't figure out how to solve them. And he is certainly the type to throw unnecessary hardware and software at a problem.

It is not very difficult to learn about your operating system. Vendors are usually willing to assist in schooling; documentation, while often complex, is usually compact; and other owners of that particular operating system usually don't mind sharing what they have learned.

One particularly helpful feature of many operating systems is the ability for them to measure activity. They can measure and record numerous types of specialized information, including data on the system's own performance, completion of jobs, hardware errors and the like. The use of these measuring systems is not without cost. While many systems record the data, you might have to build or acquire output programs to gain meaningful reports. Moreover, both machine resources and human resources are spent running and reviewing the reports.

Benefits make costs worth bearing

On the other hand, the benefits of understanding and using the operating systems' measuring features almost always make these costs worth bearing. With statistics on machine performance, you can spot bottlenecks and eliminate problems, track useage, project future hardware needs, increase machine throughput and much more. Job reporting lets you monitor and control production, improve machine scheduling, determine who is using the system and how much resources they use, monitor performance and productivity and so on.

With a benchmark understanding of how your system is running today, you can better gauge future performance changes. You can determine how systems can be designed and programmed to perform optimally. And, best of all, measurement is an introduction to other operating system features for tuning performance.

For instance, a report on task throughput could lead you to an operating system routine in which on-line transaction servicing can be prioritized.

Hence, the use of these measurements can make the difference between being ignorant of your operating system and out of control of your computer's performance or being in command of the engine that makes your computer work and being able to make it perform like a well-maintained race car.

The lesson is clear. To be a master of your operating system's potential, you merely need to follow these steps:

- Learn what information your operating system is capturing and what it could be capturing.
- Evaluate this information at least once so that you understand it.
- Analyze this information on a reasonable, periodic basis, and use this data to direct your technical decisions.
- Most important, don't wait for problems to force you or someone else to start this learning process. If you begin today, you may be able to avoid those problems in the first place.

Young is principal and director of consulting for Arthur Young & Co. in Worcester, Mass. He has worked in the industry for 15 years.

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UNITECH

CIRCLE READER SERVICE NUMBER 214

SOFTWARE VIEWPOINT

Unix Users Group Leader Predicts Shift To Posix

Robert Ackerman is the president and chief executive officer of Unisoft Corp., which assisted AT&T in developing its Unix System V verification suite. But in his role as executive vice-president of /usr/group, a Unix users group, Ackerman is an outspoken proponent of Posix, a vendor-independent, multiuser operating system definition that he says will replace AT&T's Unix System V as the industry standard.

Ackerman recently spoke with Computerworld Focus *senior writer Rebecca Hurst about AT&T's shifting influence* on *Unix and the push to make Posix a universal standard.*

What is AT&T's current position regarding Unix?

There are two ways to look at AT&T's position. Historically, AT&T has built the Unix market. Originally, the other participants in the Unix industry were small start-up companies, so AT&T was by far the dominant, well-resourced player. This has resulted in a transition during the last two years from a marketplace that was heavily fragmented to one that is consolidated around AT&T and Unix System V.

Moving forward, AT&T will continue to be a major participant in the Unix industry, but it is no longer the only multibillion-dollar supplier in the Unix industry. In the X/Open Group [a consortium of U.S. and European vendors that license Unix] alone, there are 10 multibillion-dollar organizations developing Unix product strategies. AT&T will continue to be important, but only as one of a number of leaders in the industry.

What impact are these multibillion-dollar companies having on Unix?

There is a perceived need on the part of the multibillion-dollar manufacturers for a Unix standard independent of AT&T for obvious competitive reasons. They're concerned about having to license the technology from AT&T and then competing against AT&T with that same technology. AT&T has chosen to reserve "Unix" as its proprietary name for its operating system standard, though other vendors can license System V. The problem comes when federal agencies or even large corporate users specify Unix System V in their requests for proposals because only one vendor can supply Unix System V — AT&T.

At the same time, government agencies that specify Unix System V open themselves up to the challenge from vendors that they are sole sourcing. This practice goes against all procurement policies for the U.S. federal government. So, there is pressure on the government to ask for a Unix operating system without saying Unix.

The pressures placed on users, together with those on vendors, have given impetus to growing acceptance of Posix, the Institute of Electrical and Electronics Engineers' (IEEE) portable operating system based on Unix.

Q&A

Robert Ackerman

> ***We're simply coming up with an independent definition of Unix that can be supported by all the manufacturers as they best see fit.***

What exactly is Posix and when can we expect it to be acted on?

The Unix standard process has been going on for some time, but it's always been known as the IEEE standards activity. Only recently has the name Posix been attached to that activity.

Posix actually had its beginnings in /usr/group as a Unix standard that was primarily based on Unix System III. In the next stage of its evolution, the work on that standard was handed over to the IEEE P1003 committee, where it was further specified, expanded and defined. The IEEE version is very close to Unix System V.

Today, Posix is a trial-use standard. That means a draft standard has been created, and it is being circulated within the IEEE community for comments, including, "Does this address what we're trying to accomplish?" and "Are there inconsistencies here?" This process goes on for several months, so sometime between August and December 1987, one could expect IEEE to vote Posix in as a full-use standard.

Are Posix and Unix System V fully compatible?

To say that they're fully compatible would not be true. The Posix specification is a subset of Unix System V functionality.

What's important is that this subset is compatible with System V to a large extent.

We're trying to identify the minor inconsistencies between the two and resolve them so that Posix and System V are 100% compatible or at least not mutually exclusive.

The reason this is so important is that the last thing we want to do is fragment the market. We're trying to bring in an independent industry standard that is fully compatible with System V, around which the market has standardized. We have to have a very smooth transition. We don't want a jigsaw effect in which suddenly System V is out and Posix is in.

How soon will we see Posix-based products on the market?

We might see statements from the vendor community that it intends to support Posix as currently specified and will adhere to the final specification of Posix, but it would be very difficult for anyone to support Posix until it is a fully adopted standard. I am seeing a great deal of interest and activity within the vendor community including major manufacturers.

What effect will Posix have on people who use or who are considering Unix-based computer systems?

The message we would want to get to users in particular is, "Don't worry. We're not throwing a new standard at you." We're simply coming up with an independent definition of Unix that can be supported by all the manufacturers as they best see fit.

For example, vendors might take their proprietary operating systems and modify them to adhere to Posix. Other people may independently develop Posix from scratch. The focus for a user has to continue to be buying solutions, not technology, but make sure that the proposed solution is based on industry standards. Today, Unix System V is an industry standard. In two years, System V will be just one of the ways that Posix, the industry standard, will be supported.

CORRECTIONS

Kelly Clerkin of Canton, Mass.-based Corporate Software, Inc. should have been listed as coauthor, not contributor, to the article titled "Checking Out Publishing Software" [*CW Focus*, Nov. 12, 1986, page 31].

The quotations ascribed to Phyllis Mlady in the article titled "MIS Cuts Back On Micros" [*CW Focus*, Nov. 12, 1986, page 15] were incorrectly attributed to her. The statements were made by another respondent.

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CIRCLE READER SERVICE NUMBER 213

PCs Revive Mainframe Software Mart

The mainframe software market may be in for a micro-induced revolution.

In its November 1986 issue, *Computerworld Focus* reported that the remote development of mainframe software on microcomputers was beginning to catch on in MIS departments, chiefly due to a host of products that allow mainframe applications to be created on IBM Personal Computers and PC 370s. Now, the same products are being exploited by independent software vendors. By radically reducing the cost of development, this could mean a rapid proliferation of mainframe software offerings.

While remote development of software for larger machines on workstations has been a fixture in the technical and engineering markets for some years, MIS and its suppliers have steered away from the technology. The feeling among MIS generally was that it had enough problems as it was without introducing PCs as an added uncertainty. The mainframe software vendors simply followed suit.

However, the rising costs of software development and the ever-growing applications backlog of most MIS departments has made remote software development more attractive.

For once, the MIS profession has been leading the way into a new technology. Even before most mainframe software suppliers had begun to investigate remote development, MIS professionals had discovered and begun to exploit a new generation of PC/mainframe development products. The first of these have been packages — such as $4,495 MicroCICS from Los Angeles-based Unicorn Systems Co. — that allow applications for IBM's mainframe transaction system, CICS, to be put together on the IBM PC 370. Within the last few months, vendors have also brought out products that allow CICS development on IBM Personal Computer XT- and AT-class machines. These include RealCICS, at $2,000 from Chicago-based Realia, Inc., and the CICS/PC from Triangle Software Co. of San Jose, Calif.

One user of Unicorn's MicroCICS product is Oklahoma Natural Gas Co., headquarted in Tulsa, Okla. Winsford Spears, the utility's manager for systems development, says that he went with remote development for classic reasons: conservation of mainframe resources, productivity and cost.

Independent vendors join in

But, the real news about remote development may be with independent software vendors. They, too, are exploiting the PC connection.

For example, Health Systems International, Inc., a New Haven, Conn.-based independent software vendor selling into hospital MIS operations, is also a Unicorn user. The majority of its work is for Unix systems, but it does have some IBM mainframe customers. "We used to buy time on a mainframe and do our development there," says W. Richard Stevens, Health Systems' vice-president of computer services, "but, after a while, we couldn't cost-justify that. On the other hand, we couldn't justify buying a mainframe and bringing it in-house." So, instead, the company purchased a PC AT/370 and the Unicorn system.

"We do all our development work on the AT," Stevens notes. "Then, when everybody is happy with it, we buy some time on a mainframe, port the application over, do the final compile and otherwise make certain that it really will run on a mainframe. Then, we make tapes and mail it to our clients."

The result is a model for the way mainframe software could be developed on a shoestring budget. In theory, with these sort of tools, individual programmers working alone could produce applications for mainframes with *almost* the same ease that they currently turn out Microsoft Corp. MS-DOS applications.

In practice, of course, the marketing and technological realities of mainframes make it unlikely that the next mainframe blockbuster is going to come out of somebody's garage.

But, by making mainframe software development cheaper for the entrepreneur outside the garage, these products could significantly change the economics of MIS. Since the introduction of the PC, mainframes and their MIS users have been crippled by the fact that their numbers were relatively small when compared with micros, although the cost of producing mainframe software is relatively high.

Traditionally, independent software vendors have been lured away from mainframes to the PC market, in which the user base was so much larger and the cost of admission was so much smaller. By reducing the price of that admission ticket, PC/mainframe development systems could vastly increase the number of people writing for mainframes and also vastly increase the amount of software available to mainframe users. PC-development systems may soon yield a mainframe renaissance.

MS-DOS Or Unix Publishing Systems

Just as business professionals have a range of publishing requirements, there are a variety of systems to meet those needs. Moreover, the subtle variations among publishing systems can make the purchase process confusing at best. One primary decision users have to make is whether a Microsoft Corp. MS-DOS-based publishing system or Unix-based one will meet their needs best.

Because computer-aided publishing is a relatively recent development, the types of products available have polarized at the low and high ends of the market.

At the low end, applications are developed for the Apple Computer, Inc. Macintosh or MS-DOS-based IBM Personal Computers or compatibles. Two highly regarded packages for these PCs are Aldus Corp.'s Pagemaker and Xerox Corp.'s Xerox Desktop Publisher, Ventura Edition.

Hardware, communications limits

However, publishing systems based on these computers face hardware and communications limitations, according to Joan-Carol Brigham, an analyst at International Data Corp. in Framingham, Mass. "They are typically limited to 640K bytes of memory, 30M bytes of disk space and a 16-bit CPU," she explains. Also, linking separate PCs to a local-area network file server is not as easy as using a multiuser, Unix-based system, notes Tony Bove, editor of "Desktop Publishing," a monthly report on the electronic publishing industry.

At the high end, applications are

See **PUBLISH** page 9

JEFF BARNEAU

Vendors Peddle 386 Operating Systems

Microsoft Corp.'s MS-DOS has been the software talk of the town lately, now that Intel Corp. 80386 microprocessor-based computers are putting pressure on Microsoft to get its operating system act in gear.

Microsoft has cooly responded to the pressure by saying that the public will probably not see applications written for its protected-mode operating system (sometimes referred to as MS-DOS 5.0, sometimes as Advanced DOS) until the end of this year. That leaves a time gap, and a big one, between the 386 hardware now coming on the market and its next-generation operating system from the industry's highest profile software company.

A gap to some, a window of opportunity to others. Into the breach have come a number of software vendors peddling alternative operating systems for the 386 machines, hoping to grab a quick share of the 386 market before Microsoft and IBM.

The Software Link, Inc., headquartered in Atlanta, is gaining some publicity (if not users) with its PC-MOS/386 multiuser, multitasking operating system. The firm says MOS/386 is compatible with Microsoft's current operating system versions and it takes advantage of the 386's 32-bit protected-mode feature. Software Link also claims its operating system can support up to 25 users.

Pick Systems, the Irvine, Calif., firm that has been nipping for years at the flanks of the IBM mainframe software market, has jumped into the fray, porting its Pick operating system to the 386 processor and touting operating system compatibility from micros to mainframes. Claiming the Pick operating system market reached $1.3 billion in 1986, the company is hoping that its 386 Pick version will provide good leverage in winning over a contingent of clients this year — users who can't wait for IBM to give more operating system homogeneity across platforms.

Windows To Play Role As 386 Tool

Forrester Research, Inc., a Cambridge, Mass., market research firm, claims that Microsoft Corp.'s Windows will play a larger role as a migration tool and graphics interface to the Intel Corp. 80386 operating system. Forrester says Windows already includes features that will be in MS-DOS 5.0, including a clipboard for low-level interprocess communications, improved memory management and limited multitasking.

Microsoft has itself stated that applications written to Windows specifications will run under MS-DOS 5.0, and Forrester sees Windows as the bridge between IBM Personal Computers running MS-DOS 3.2 and Intel 80286 or 80386 systems with MS-DOS 5.0.

For Forrester, the 386 processor and MS-DOS 5.0 will finally unclog a static PC software market. It also predicts that the changeover to a new generation of software will reshuffle the software market.

Forrester says software winners and losers will be differentiated by the following criteria:

- The ability to manage the development of complex software in the MS-DOS 5.0 environment.
- The creation of software extending beyond what users can do today, such as distributed data bases.
- An ease of use in applications that lures a new group of users from the manager, executive and professional levels to use PCs, with programs developing around smart windows.
- Account control with innovative licensing agreements.

If software vendors can meet at least three of these four issues, Forrester predicts they will be a success in the new PC software arena.

"A good number of these second-generation PC software vendors will come out of the minicomputer/mainframe marketplace," says John McCarthy, an analyst at Forrester. "Companies like Access Technology, Inc. in the spreadsheet area, Oracle Corp. and Informix Software, Inc. in the data base area

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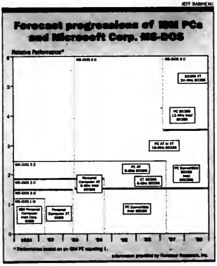

NEWS ANALYSIS

Posix Challenges AT&T's Unix System V

Just when you thought it was safe to call AT&T's Unix System V an industry standard, a challenger is riding in on the waves of user support.

General Motors Corp. and the U.S. government, two large, influential, standards-minded users, have publicly announced their support of Posix, the Institute of Electrical and Electronic Engineers, Inc. (IEEE) portable operating system standard.

Users agree that the attraction of Posix, which closely resembles Unix System V, is its vendor independence. More specifically, it frees everyone from their dependence on Unix's developer and sole licenser, AT&T.

The most visible government support of Posix has come from the National Bureau of Standards (NBS). In August 1986, the bureau proposed in the federal register that Posix be established as a Federal Information Processing Standard (FIPS). Moreover, the standards bureau has been working with IEEE to develop a validation suite that will evaluate a product's compliance with the Posix specifications, says Al Hankinson, the NBS's chief of systems and software technology.

'Posix is attractive to us'

In the private sector, GM has issued a letter to vendors stating that it will support AT&T's Unix System V standard until there is a full-use national standard, reports John Williams, senior manufacturing project engineer at GM. "A standard such as Posix is attractive to us," Williams says. "If we have a national vendor-independent standard, more people will adhere to it."

"The standards process will bring about a consensus as to what users want, and more suppliers will adapt products to address that consensus," NBS's Hankinson concurs. In part, GM's letter was designed to inform vendors of the company's future standardization goals so that vendors can provide products that meet those goals, Williams explains.

Despite the activity by users, Posix is not expected to become a full-use standard until the last quarter of 1987. It will then be another six to nine months before the NBS approves it as a FIPS, Ackerman says. It is also unlikely that vendors will provide commercial implementations of Posix before 1988.

However, the government and business users alike should prepare for Posix, NBS's Hankinson asserts. "Users have to develop a transition stategy that will take them from their Unix-based systems today to one that recognizes Posix," he recommends. This strategy includes plans for procurement. "Posix will be here and will be a major factor."

Ada Moves Into Commercial Mart

From the bowels of the Department of Defense, a programming language is taking some bold steps into the commercial programming world.

Ada is not a new language, dating officially from 1977 when the DOD christened it as its future language of choice.

During the years, Ada has won over its share of believers. The language uses a programming logic structure that makes Ada programs easy to maintain, something of which Cobol shops, with their reams of entangled spaghetti code, have only dreamed.

Ada, in essence, contains an amalgam of the best features of other languages: Cobol's data base handling, Fortran's math, Pascal's programming logic and C's strength in communications. And Ada contains facilities that make it fairly easy to interface it with other languages.

Why the late commercial arrival?

All well and good, but why the late arrival in the commercial area? For one thing, Ada has been tied so closely to the military in the past that it created its own coterie of inside programmers and an aura of inaccessibility to commercial users. It also did not get the outside support and publicity it needed from major software and hardware vendors.

"As a result, there were just not enough Ada support tools being developed," explains Bruce Lynch, president of the Programmer's Shop, located in Hanover, Mass. "Now that these tools are coming out, there will be a two- or three-year gestation period before Ada really makes a splash [commercially]."

Lynch says a good starting point for Ada are those programming shops that have abandoned Cobol to strike out with PL/I or Fortran. "Ada is a stronger language than Cobol and has similar strengths to PL/I," Lynch explains. "Ada can be a good extension to PL/I in large programming groups that need clear, logical programming."

IBM, in its inimitable way, is helping the Ada cause. The company has licensed Telegen2, an Ada development system from San Diego-based Telesoft, to run on IBM's 370, 4300 and 3090 lines under the IBM VM and MVS operating systems.

Ada will also get help in other areas. In the avionics, telecommunications and factory automation markets, the increased use of more powerful, cheaper embedded processors is turning more and more people to Ada.

As the U.S. Army converts an increasing number projects toward Ada, outside contract programmers will take that expertise back into the commercial arena.

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and Applix, Inc. in office automation have the necessary experience with more complex software development efforts."

IBM's 9370 Line Puts VM In The Spotlight

IBM's recent introduction of its 9370 family of Micro370 computers has suddenly taken the software spotlight from MVS, IBM's premiere operating system, to its VM operating system.

Ironically, VM, which IBM critics claim has been given short shrift by IBM, now appears to be IBM's operating system of choice in its bid to provide mainframe software at the low-end, departmental level.

This presents an interesting scenario. While VM is pushing steadily downward into the departmental level, the Intel Corp. 80386 processor has a virtual memory facility that can accommodate VM development. Some analysts say they believe IBM will take advantage of this feature to tie VM into its own 386 microcomputer, which is expected to arrive on the market later this year.

In this regard, the 9370 family could be a pivotal point in IBM's departmental computing strategy, poised between the 386 and its higher end minis and mainframes — and not just in the business community. Many vendors expect the 9370 to become a big seller in the manufacturing and scientific areas as well.

Mitrol, Inc. of Woburn, Mass., for example, has even put a fourth-generation language-based manufacturing resource planning (MRP II) system on the 9370. Mitrol says its clients will now be able to migrate its MRP II system from IBM mainframes to the 9370s as those systems become available in 1987.

"We think the 9370 family will become big players in the manufacturing environment," explains Dan Franck, senior design engineer at Mitrol. "I wouldn't be surprised if IBM even comes out with a ruggedized 9370 to get it right onto the shop floor. I don't think we're alone in that assessment."

* * *

News section compiled by Computerworld Focus *staff members Stan Kolodziej, Michael Tucker and Rebecca Hurst.*

Using Interactive Software To Program

Can a packaged application development system make a dent in traditional large systems programming productivity?

"It did for us," explains Steve Grice, systems analyst at Reynolds & Reynolds Co. in Dayton, Ohio. "We had a need to crank out code quickly, and there was no way we were going to do it with Cobol using standard programming methods."

Grice has been using the Application Factory from Cortex Corp. in Waltham, Mass., to develop a raw stock tracking system to keep tabs on paper supplies and another system to track the company's field service people.

For the DEC environment

Cortex says the product is a package carrying programmers through the entire software life cycle from design specifications, prototyping, coding and maintenance stages of large applications on Digital Equipment Corp. VAX systems.

"We were a traditional Decsystem-10 shop, but we reached the stage where we debated whether to go with IBM or stay with DEC," Grice says. "We decided to bring in a VAX-11/785 and VAX 8600 and go with Application Factory."

Grice says it took only 10 weeks for two programmers to put up the inventory system using the Application Factory, a pace he describes as very fast.

Products such as the Application Factory have an advantage over conventional code generators because they let programmers enter the specifications for the applications interactively and on-line. The systems then use the specifications as a basis for automatically generating code in less time than conventional programming methods. In effect, Grice says, the system was designed to teach a computer to program.

Other large development systems packages, many of them based on fourth-generation languages, are gaining popularity with large user installations requiring quick system uptime and a minimum of back-end maintenance.

Companies such as Promod, Inc., with its Promod system, Applied Data Research, Inc. with its Datacom/DB data base and Ideal language and Pro Computer Sciences, Inc. with its Pro-IV system are chasing part of a total U.S. software productivity tool market of $5.8 billion in 1987, as forecast by International Data Corp., a market research firm located in Framingham, Mass.

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designed for Unix-based workstations or minis. Two such packages include Interleaf, Inc.'s Text Publishing Software and Context Corp.'s Context Document Software. Unix-based systems are generally workstations based on full 32-bit processors, Brigham says. These workstations have a large local disk and up to 4M bytes of memory.

Among users who already have publishing systems, many have made their decisions based on the types of computers they already had at their desks, according to analysts of Seybold Publications, Inc., a Malibu, Calif.-based market research firm. Users of MS-DOS-based publishing software already have access to an IBM PC or compatible, says Peter Dyson, a Seybold analyst.

Similarly, Unix-based publishing software is often used by people who already use Unix workstations for their scientific or engineering applications, says Jonathon Seybold, president of Seybold Publications. However, many Unix-based publishing systems are found in firms in which publishing is the primary activity and the company can cost-justify the system, he adds.

Business professionals can set up a publishing system more cost-effectively if they purchase software that works with their current computers, but, according to Bove and Seybold, managers considering a publishing system should ask the following questions:

■ *How much data do I have to publish at once?*

The smaller the publishing job, the more attractive a PC is, Bove asserts.

Only if PC or Mac tools cannot meet the users needs should they move up to a Unix system, Seybold says.

■ *How many people will be using the system?*

"If there are two to four users, go with PC systems," Bove suggests. "If there are 10 or 20, look at Unix. Anywhere in between is a gray area where you need to ask a lot more questions," he says.

■ *What is the system's cost per user?*

Unix systems offer more features, but they are far more expensive and more difficult to cost-justify. For smaller publishing applications, PC-based systems will probably prove the most cost-effective.

Finally, users should consider that the gap between PC and Mac and Unix publishing systems will narrow in 1987 with the introduction of better networking software and publishing applications, analysts agree.

MICROS FUEL UP FOR 386 TAKEOFF

• BY • THOMAS • ROBERTS •

The technical potential of the 80386 microprocessor is, in a word, astounding. In September 1986, Compaq Computer Corp. became the first company to introduce a PC built around the Intel Corp. 80386 microprocessor. At the Comdex/Fall trade show little more than a month later, practically a dozen companies followed suit with 80386-based systems of their own.

But the 386 systems available today are essentially souped-up versions of IBM Personal Computer ATs. These 386 machines are not living up to their potential, nor will this potential be fulfilled for some time to come.

The root of the problem lies in operating systems software. In the IBM Personal Computer and compatible world, advances in hardware are generations ahead of systems software development.

This gap between hardware and software is causing considerable confusion in the PC marketplace. At times, the confusion seems to be fueled by reports centering on the technical virtues of 386 systems without fully explaining when or how those virtues will be realized.

Much of the excited talk surrounding the chip at the heart of 80386 systems may sound like sales hype. It is not. Intel's latest microprocessor represents minicomputer power embodied in a single silicon wafer. The 386 is a full 32-bit CPU, which, by most estimates, will achieve processing speeds of 3 million instructions per second (MIPS) to 4 MIPS. Onboard memory management features will address vast amounts of memory.

Any 386 system has the potential to recognize up to 4G bytes of physical memory and 64 terabytes of virtual memory. The chip provides support for protected multitasking and was designed to run more than one operating system concurrently.

What's more, the 80386 maintains compatibility with earlier microprocessors in the Intel line. The IBM PC and compatible family of personal computers has been powered by Intel processors for the past five years. More than 6.5 million PCs installed worldwide belong to this IBM and compatible family, according to International Data Corp., a Framingham, Mass.-based market research firm. These computers are currently running software programs believed to be worth more than $6 billion in aggregate. Provisions have been made in the 386 design that allow it to run the vast number of programs already written for IBM and compatible equipment.

The market, however, is far from having a Microsoft Corp. MS-DOS operating system that will exploit the capabilities of the 386. In fact, the systems software gap is so great that the industry is still waiting for an MS-DOS built specifically for Intel 80286-based PC ATs and compatibles.

Sure, the PC AT now runs on Microsoft's MS-DOS 3.0, 3.1 or 3.2, and these versions of MS-DOS have allowed well over half a million PC AT users to accomplish a lot. But when it comes to maximizing the potential of the 286 processor in PC AT-style systems, these versions of MS-DOS do very little.

The 80286 chip itself is no laggard. The protected mode of the 286 offers full 16-bit processing,

JOHN OWENS PHOTOS COURTESY U.S. AIR FORCE, 99TH AERIAL REFUELING SQUADRON AND THE 1ST TACTICAL FIGHTER WING

access to 16M bytes of physical memory and protected multitasking capabilities. Most PC ATs and compatibles have never been run in protected mode, however. Lacking an MS-DOS operating system to exploit the protected mode, most ATs have been running in real mode. In real mode, an 80286 basically acts like a fast 8086 processor, ignoring its own advanced memory and multitasking features.

A new MS-DOS operating system for the protected mode of the 80286 is on the way. But MIS and users have been waiting for this operating system since the first PC ATs were introduced. Moreover, new applications software will need to be written to take advantage of this upgraded MS-DOS.

The first of these applications will probably not appear until six months after the operating system debuts. If a 286 MS-DOS should become available by the middle of this year, that means it will be the end of 1987 before meaningful applications will appear. That is almost three and a half years after the first 286-based PC AT systems were introduced by IBM.

386 hardware: The generation gap

The discrepancy between PC hardware and software development becomes even more pronounced when looking at the 386 generation of systems. It is somewhat simplistic to think of PC hardware in terms of generations, but for the sake of this discussion, it serves an important purpose. If one traces the lineage of the IBM PC family and compatibles, the PCs, PC XTs and compatibles represent the first generation of these computers while the PC AT-style systems represent the second and 80386-based PCs represent the third.

With the availability of 386 PCs, hardware development has effectively jumped two generations ahead of operating systems software development. For example, according to Microsoft's own estimates, a new version of MS-DOS designed specifically for the 80386 will not be ready until sometime in mid-1988. This means that applications built to run under the native mode of a 386-specific MS-DOS may not appear until the end of 1988 at the earliest.

There are several theories about why PC operating systems are so far behind their hardware counterparts. Underlying all of these, however, are some very basic economic factnrs.

When IBM decided to open its PC architecture, it invited competitive third-party software and hardware vendors to make and sell whatever applications and accessories they could dream up. Of course, much of the PC's success is owed to this decision. But a large part of IBM's current headache in the PC market is also due to the open architecture. PC-compatible and clone manufacturers have achieved great success in the last 12 to 18 months at the expense of IBM's market share and bottom line.

At last count, there were more than 65 companies selling IBM-compatible PCs. This market is becoming more and more crowded every day. Vendors looking for a competitive advantage are bound to do one of two things: cut their prices or push the technological boundaries of the product they are selling. Hence, prices for low-end PCs are rapidly dropping below the $500 mark. Also, 386 PCs showed up as soon as the first chips passed final testing and began rolling off Intel's fabrication lines.

Operating system software for the PC environment is quite a different story, with Microsoft holding a quasi-monopoly. Of course, no one is required to buy or run MS-DOS on a PC. But who would choose to ignore the treasure trove of applications software available for MS-DOS? Not many people, judging by the relatively small success of Microsoft's Xenix and Unix compared with MS-DOS.

Is Microsoft the pirate ship of the PC industry? Quite the contrary. Operating systems development is not a trivial task, and Microsoft is hard at work on a new 386 version. But the fact remains that intense competition in the PC hardware arena has spurred development at a much faster rate than the progress of operating systems software.

However, the world is highly competitive. One would think that an MS-DOS alternative better suited to take advantage of underutilized hardware would start to win some converts. As it stands, there are several alternative systems or utilities that are vying to do just that.

The most obvious of these are the old standbys, Xenix and Unix. Along with the Compaq 386 announcement last September, Microsoft promised that a version of Xenix System V/386 would be available by the first quarter of 1987. AT&T's Unix port for the 386 is also scheduled for certification and delivery in the first quarter of this year. That is more than a year before the industry can expect to see delivery of MS-DOS for the 386.

Unix and Xenix, which is a superset of Unix System V, are both better suited than MS-DOS to take advantage of advanced features on the 386 processor. MS-DOS is essentially trying to grow out of the 8-bit environment in which it was spawned. In comparison, Unix was born and bred in a 32-bit minicomputer environment and has been moved down onto smaller processors. Support for a 32-bit instruction set, a large linear address space and virtual memory are inherent to Unix. This is not the case with MS-DOS. Major additions must still be grafted onto MS-DOS to take advantage of features not found in the more constrained environment of an 8-bit processor.

Progress in Xenix, Unix

The most often-heard complaint about both Xenix and Unix has been the lack of software available for general business applications. But there has been definitive progress here. There are now more than 2,000 general business applications programs running under Unix System V.

Assuming that a good portion of these applications get ported to 386 PCs, does that mean that users will begin jumping from MS-DOS to Unix? It is doubtful. Despite the technical advantages of Unix or Xenix in a 32-bit environment, there are still three strikes against Unix with the majority of PC users:

■ *Technical Sophistication.*

The average PC user is not an avid fan of technology. As a result, Unix is a hard sell for the typical PC user. Most do not care what operating system they are using, let alone the benefits of such arcane things as virtual memory or 32-bit instruction sets.

■ *Ease of Use.*

Beginning to use Unix is probably not a whole lot harder than beginning to use MS-DOS. Many MS-DOS users, however, think that Unix is significantly more difficult. The majority of users comfortable with MS-DOS will, therefore, be reluctant to invest time learning a new Unix operating system.

■ *Price.*

While a copy of MS-DOS costs about $85, a comparable Xenix license commands a price of approximately $500. Applications software in the Xenix and Unix arena is also typically bigher priced than MS-DOS applications.

That brings us to the 80386's ability to create virtual environments running different operating systems simultaneously. The chip can run a single 286 or 386 operating system, along with several copies of 8086 operating systems, in what is called the virtual 86 mode. Virtual 86 mode effectively emulates several Intel 8086 computers running at once. That means that several copies of MS-DOS (Release 2.0 or 3.0) can be loaded into these virtual 86 machines, along with copies of existing MS-DOS applications. While the limitations of MS-DOS, such as the 640K-byte memory barrier, cannot be avoided with this scheme, it is a viable way to get protected multitasking capabilities with existing applications.

Several companies are working on software control programs for the virtual environment. Two firms that have won considerable attention for their MS-DOS and Unix integration on the 386 are Phoenix Technologies Ltd. and Locus Computing Corp.

Phoenix is famous for putting a prefabricated thorn in IBM's side by selling its PC-compatible read-only memory BIOS specifications. Now, in conjunction with Interactive Systems, Phoenix has announced the creation of a control program called VP/IX that permits 80386-based systems to run PC-compatible MS-DOS applications as a task under Unix. Interestingly, Phoenix has also signed an agreement with Microsoft to provide a similar VP/IX link between Xenix and MS-DOS. Locus has announced a similar product called Merge 386.

Both of these products maintain the multitasking and multiuser capabilities of Unix and allow file sharing between Unix and MS-DOS. A user may also invoke MS-DOS applications from within Unix and vice versa.

But both VP/IX and Locus's Merge 386 are products that will appeal to a relatively small proportion of users in the overall PC market. High-end PC users running computer-aided design or technical applications will be more apt to move toward Unix if access to old MS-DOS applications is guaranteed. With full-blown Unix available on an Intel-based system, some workstation users may also be tempted to move to a 386 PC if they get the added benefit of running MS-DOS software.

For the majority of single-user 386-based systems, however, the operating system of choice will almost certainly be MS-DOS. And, if that is the case, most of the 386 PCs bought in the next two years will struggle valiantly and wait for operating system software to catch up.

Roberts is a research analyst with International Data Corp., a market research firm based in Framingham, Mass. His research and consulting services focus on the effective use of PCs in office automation.

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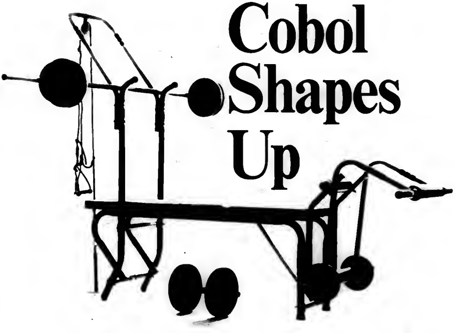

Cobol Shapes Up

•BY•STAN•KOLODZIEJ•

For some time now, Cobol's detractors have been keen on painting the venerable computer language as an aging warrior ready to be retired.

Much to the chagrin and surprise of many, however, Cobol has been busy pumping iron to get back into shape. Cobol, in fact, is drawing on some major strengths to flex new muscle on several market fronts.

The critical mass of Cobol mainframe applications and the sheer numbers of programmers well versed in the language have swelled during the past 25 years. It has been estimated that more than 75% of existing mainframe applications have been written in Cobol. Supported by its widespread user base, Cobol has proven tenacious in resisting the change to fourth-generation languages, which appear to be the heirs apparent to Cobol and other third-generation languages.

Another factor adding to Cobol's punch comes from a growing supply of third-party software vendors that are busy streamlining all stages of Cobol's application life cycle, even catapulting the language onto the new breed of powerful microcomputers currently appearing on the market.

"I wouldn't call it a renaissance of Cobol," explains Larry Timmins, a research analyst at the Gartner Group, Inc. in Stamford, Conn. "Cobol never died. There are just so many Cobol applications out there that are keeping other languages from moving in, and the people who are making the big programming decisions are still Cobol based."

The increased activity in the Cobol marketplace has centered on two broad thrusts: restructuring the language and existing mainframe Cobol programs; and migrating Cobol's core building blocks to run on smaller processors, creating new Cobol applications away from centralized mainframe environments.

The first movement has its base in the work done by the American National Standards Institute (ANSI). ANSI's Cobol 74 standard was a step forward in making Cobol a more structured programming language over the preceding Cobol 68 standard. Another major leap in restructuring Cobol came recently with ANSI Cobol 85, a standard that offers further advances in Cobol code generation.

Using both Cobol 74 and 85 standards as touchstones, a number of software vendors, such as Peat, Marwick, Mitchell & Co. Catalyst Group with its Structured Retrofit, Language Technology, Inc. with its Recoder and IBM with its Cobol/SF, have in recent years carved out a growing client base by supplying Cobol retrofit packages to larger mainframe installations that are experiencing trouble upgrading older Cobol programs.

"These products basically use various scorecards to rate how structured the existing Cobol code is. Then the firms provide tools to get the programs up to what is deemed an acceptable structured Cobol level," Gartner Group's Timmins explains. "It's an interesting trend because it forms an incentive to get people to get their code up to some sort of structured snuff," he adds.

IBM also helped set the Cobol upgrade wheels in motion in December 1985 when it introduced VS Cobol II, the company's tipping of the hat to ANSI Cobol 85. Though VS Cobol II is an MVS Cobol compiler, it is not, however, fully certified, and IBM stopped short of using all of the programming enhancements laid out in Cobol 85.

Nonetheless, VS Cobol II has become a watershed of sorts for Cobol. It represents IBM's faith in Cobol 85 as an important base for future mainframe programming. It has also given a green light to third-party software developers to use VS Cobol II and Cobol 85 compatibility as perceived selling points in introducing new mainframe and micro Cobol compilers.

"When IBM began marketing VS Cobol II, that's when the new Cobol market started taking off," says Paul O'Grady, executive vice-president of sales for Micro Focus, Inc., a Palo Alto, Calif., developer of Cobol compilers for microcomputers. "It set the trend."

However, the new Cobol market has taken off slower than expected in the existing mainframe world. The same built-in inertia that has helped fend off the incursions of other languages has also proved a barrier to MIS converting en masse to Cobol 85.

"I would say the majority of mainframe sites are drifting over to Cobol 85," Timmins says, "but they certainly aren't hurrying."

In this conservative MIS climate, fourth-generation languages also have not fared well in their mission to convert old Cobol systems. Where fourth-generation languages *have* managed to make some inroads is within a small core of corporations willing to experiment with new system development.

The East Bay Municipal Utility District of Oakland, Calif., for example, developed a new materials management system using the Application Factory, a set of fourth-generation language modules from Cortex Corp. headquartered in Waltham, Mass.

According to Ross Mitchell, a Newtonville, Mass., consultant who is helping the utility develop the new system, East Bay was a solid Cobol shop until 1984. "It looked at bringing the [materials management] applications up in Cobol and figured it would require seven man-years to develop an on-line system," Mitchell says. "Developing the system in the fourth-generation language will take about 15 man-months."

Mitchell estimates the finished core applications will be made up of a total of 500,000 lines of code, an argument against those who malign fourth-generation languages as being unsuitable for large-scale application development.

"The changeover [to the fourth-generation system] has been good," explains Herman Nichols, East Bay's manager of purchasing and a user of the new system.

Cobol programming on micros is not a new phenomenon, but recent advances in microcomputer hardware and software are ready to break it wide open. The big push will come from the onrush of Intel Corp. 80386-based micros expected in 1987. The 32-bit architecture and increased speed of the 386 machines are naturals for programmers.

Another catalyst will be Microsoft Corp.'s 286 DOS operating system, which will take advantage of the protected-mode feature of the Intel 80286 and 80386 processors to overcome the inherent 640K-byte memory limitations of existing MS-DOS operating systems. These developments are promising to boost the micro a quantum leap into the realm of Cobol programming, making true off-loading of mainframe Cobol programming resources finally a reality.

"There are two forces driving the Cobol industry now," explains Micro Focus's O'Grady. "The first is ANSI Standard 85, and the other is the migration of application development from the mainframe to the micro. The latter has major ramifications for mainframe people. We've now reached the stage where you can run [Cobol] application code on micros and expect reasonable response time. The only limiting factor now is MS-DOS and that will soon disappear" with the arrival of 286 DOS, O'Grady adds.

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> *'I wouldn't call it a renaissance of Cobol. Cobol never died.'*
>
> **— Larry Timmins**
> **Gartner Group, Inc.**

Vendors, scenting a new market opportunity, are jumping in with micro Cobol application software, most of which duplicates IBM's CICS programming environment. These packages typically use the same screens, commands and sequences familiar to CICS programmers. The reason the Cobol micro vendors are concentrating on CICS applications is simple: According to recent Gartner Group estimates, there are now more than 25,000 CICS user sites worldwide.

IBM, in its way, helped nudge this market along when it introduced Ez-Ed, an ISPF tool for Cobol applications development on IBM Personal Computers.

"It will take another year to establish the market for Cobol on micros," claims Steve Tryon, president of Alameda, Calif.-based MBP Software and Systems Technology, Inc., makers of Visual Cobol, a compiler for IBM PCs. "The 386 machines are going to give virtual address space, and with the extra processing speed and hard disk, full-fledged Cobol on micros will be here."

The verdict is starting to come in from the users of these micro Cobol systems. Becky Stedman, a consultant with J. T. S. Computer Services, Inc., located in Rochester, N.Y., helped some of Xerox Corp.'s Latin American divisions install Visual Cobol on PCs to write accounts receivable and general ledger applications.

"The applications are both developed and run on micros," Stedman explains. "The [Visual Cobol] package has some nice features such as a Shrink command and Mask editor. The applications aren't the fastest, but for our purposes they're fine." (The Mask editor is part of Visual Cobol's screen painting facility. The Shrink command is a utility for reducing the size of Execute files.)

David Howard, manager of Credit Coordination, Systems Group, at the Chase Manhattan Bank in New York, says the bank is using Visual Cobol to produce programs tracking credit authorization for commercial clients. "The whole purpose is to put the data entry out where the data is," Howard explains, "and take some of the load from our IBM 3090."

Howard has nothing but good things to say about Visual Cobol's screen management and debugging facilities, which he claims make program maintenance easier. His only complaint is that the compiling is slow. The bank plans on expanding its use of micro Cobol programming, developing applications to keep track of documents related to the credit transactions.

Wendy's International, Inc. of Dublin, Ohio, is a beta test site for Quicktask, a CICS applications development tool from Columbus, Ohio-based Goal Systems International, Inc.

"We're using it to develop everything from sales to payroll applications," explains Allan Huffman, director of Technical Systems at Wendy's head office. "Quicktask eliminates the need to know 95% of CICS programming knowledge. The system programs more like a batch application. You still have to understand some of the CICS logic, but not much."

Huffman says Quicktask has been great on the development side, pointing out the package's test debugging tools that enable programmers to check each instruction automatically and correct problems on the fly.

Ironically, this gradual off-loading of Cobol applications onto micros might pose yet another stumbling block for those fourth-generation language vendors trying to rebound from dedicated Cobol mainframe shops to the relatively new field of micro and end-user applications development.

"But it's not going to be an either/or situation at the micro level," claims Mike McCandless, telemarketing sales manager at Micro Focus. "Software developers are always looking for better ways of programming for business applications. That could include fourth-generation languages. We're not tied to Cobol."

McCandless claims that fourth-generation language-like tools have already been integrated into his firm's Cobol screen management facility. He adds that a series of Cobol code-generating tools, which simulate those already being used with fourth-generation languages, will soon appear on the market from several vendors. O'Grady adds: "We see Cobol as going way beyond classical applications. I can even see [Cobol] being used to write fourth-generation applications in the future."

The Gartner Group's Timmins agrees. "Cobol will begin interfacing with other languages. I think it will be crucial for Cobol to incorporate new code structures to keep up with developments in artificial intelligence. If it doesn't, another language will fill the gap and push ahead."

SQL as a starting point

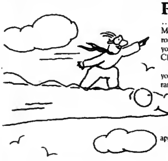
Timmins says a good starting point is IBM's SQL. SQL has become a de facto interface standard between users and various data base management systems. Prior to SQL, every DBMS supplier used its own data base language, in effect forcing applications developers to learn a new language each time they built software for a new DBMS.

To date, there have been a number of micro SQL/Cobol products coming onto the market from such vendors as Informix Software, Inc. of Menlo Park, Calif., and Oracle Corp., located in Belmont, Calif. What these vendors provide are high-level tools to build applications in Cobol, allowing direct access of SQL data bases from Cobol programs without having to convert data types.

"SQL will eventually give users the ability to start sharing Cobol code," Timmins says. "When that happens, they will be able to isolate the logical part of programs and move them to different [processor] platforms to be worked on."

"In spite of all these activities within the Cobol market," explains Micro Focus's McCandless, "it's good to remember that Cobol is still a language for programmers. While all these Cobol improvements are aimed at hiking programmer productivity, they might also be clearing the path for fourth-generation languages to fulfill their destiny as programming tools for end users." ◼

Kolodziej is Computerworld Focus *senior editor.*



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TECHNOLOGY TRENDS

Magnificent Monsters, Fabulous Hybrids

Increasingly, MIS officers are being asked to join Unix and IBM's proprietary operating systems into a single supersystem.

• BY • MICHAEL • TUCKER •

Linking dissimilar operating systems in the same data network can be one of the greatest challenges for MIS managers and one that is becoming increasingly important. In particular, MIS is being asked to link Unix-based computers with IBM systems.

Given a choice, MIS would probably pick one operating system and stick with it. But, the single operating system option may no longer be the best choice for most large corporations. In this age of open systems, chief executives hunger for the freedom of multivendor solutions. But the reality of corporate computing is usually a collection of Unix systems from assorted sources more or less grafted onto an installed base of IBM mainframes, minicomputers and Personal Computers. MIS is then expected to make this hybrid work efficiently.

As a result, MIS is desperately seeking software that allows it to link Unix systems downward to PCs and upward to mainframes. Fortunately, products that allow Unix to be linked with Microsoft Corp.'s MS-DOS and to IBM's VM and MVS do exist today. Indeed, MIS officers can actually use such products to manage and control personal computers and multiuser micros that fall outside their traditional authority.

The problems of integrating Unix and IBM systems are, of course, actually part of the larger issue of open systems and communications standards. As the integration efforts of such projects as the Manufacturing Automation Protocol (MAP) and the Technical Office Protocol (TOP) eventually bear fruit, the number of Unix-to-IBM options open to MIS will increase beyond measure.

But we're not there yet. Indeed, when *Computerworld Focus* contacted Boeing Computer Services Co. and General Motors Corp. about Unix-to-IBM links under TOP and MAP, respectively, both pointedly declined to comment. Still, for at least some situations and some machines, products that join Unix to IBM systems are becoming almost commonplace.

The most obvious link of operating systems is, of course, the connection between Unix-based departmental systems and the MS-DOS-based personal computers on end users' desks. And, because it is the most obvious link, the market has produced quite a number of Unix-to-DOS bridge products.

MIS managers wishing to link PCs directly with Unix systems can exploit such products as Synchrony from Ann Arbor, Mich.-based Cosi, Inc. Synchrony allows a PC to operate as a terminal of a Unix system, provides file transfer between the two systems and permits the Unix system to execute MS-DOS programs on the PC. Synchrony is currently being remarketed by AT&T.

One Synchrony user is Bell South, a regional Bell operating company in Atlanta. Jim Tamburrino, Bell South's segment manager for purchasing, notes: "I'm using Synchrony in a multimachine environment where we've got dumb terminals on some desks and PCs on others. All of them hook into a Unix departmental machine for office automation. The departmental machine then hooks up to a corporate mainframe."

Basically, Tamburrino says, Bell South is using Synchrony as a terminal emulator. But, he adds, "It also lets me unload some of the drainage on the departmental OA system. For instance, it lets me get the heavy word processing users off the Unix machine and onto their own PCs."

For those MIS people who need to go further and blend the two operating systems on a single machine, a number of options are currently on the market. Among the most popular of these is Multisystem Merge from Locus Computing Corp. Multisystem Merge, composed of Merge 286 and Merge 386 products, is an inexpensive and relatively undemanding method of joining MS-DOS and Unix on PC AT-class machines. Multisystem Merge allows MS-DOS to run as a task under Unix. Files can be transferred between the two with relative ease, and as such, a Merge-equipped machine can function as a gateway between a PC local-area network (LAN) and larger Unix systems.

AT&T is one of several firms currently reselling the product. The company's PC 6300 Plus, for instance, contains the product as

TECHNOLOGY TRENDS

OS/Merge. But, Multisystem Merge's real future may be in still larger machines. At Comdex/Fall '86, Locus introduced Merge 386 for microcomputers based on the Intel Corp. 80386 processor. If, as some analysts suggest, 386 machines show up with increasing frequency as servers within PC networks, then products like Merge 386 could make MS-DOS-to-Unix links mundane.

However common the MS-DOS-to-Unix merger may become, wedding Unix to IBM's proprietary operating systems is bound to be a union with a bit more pomp and circumstance. In fact, the necessary vows can be restrictive and expensive.

Common Unix/IBM hybrid

Still, options do exist for networking Unix machines to IBM mainframes, and some MIS officers are finding such links useful in solving otherwise very thorny micro-to-mainframe problems. Indeed, the single most common manifestation of a Unix/IBM hybrid is probably where Unix-based multiuser micros (of the Personal Computer AT-class or above) are linking upward to IBM mainframes.

For example, Zellers, Inc., a Montreal-based department store chain, recently invested heavily in a mixed network connecting its 210 stores with a corporate IBM mainframe. The underlying physical reality of Zellers' problems was that each of the stores contained a collection of either IBM or NCR Corp. point-of-sale systems that had to communicate with a file-serving AT-class micro. The micro, in turn, then had to communicate with the corporate IBM mainframe in Montreal as well as perform bookkeeping and accounting operations for the local concern.

The micro's operating system thus had to be both multitasking and compatible with IBM's communications protocols. "If there had been a multiuser [MS-DOS] available, we would have gone with it," notes Terry Moore, Zellers' vice-president of information services. "We needed multitasking, and there wasn't a multitasking [MS-DOS] on the market. We really didn't have any choice."

So, Zellers went with Microsoft's Unix-derived Xenix for the PC ATs. Its suppliers were AW Computer Systems, Inc. of Mount Laurel, N.J., which did both hardware and software work, and the Santa Cruz Operation, Inc., which contributed Xenix and the Unipath SNA-3270 mainframe communications package, an IBM Systems Network Architecture (SNA) implementation.

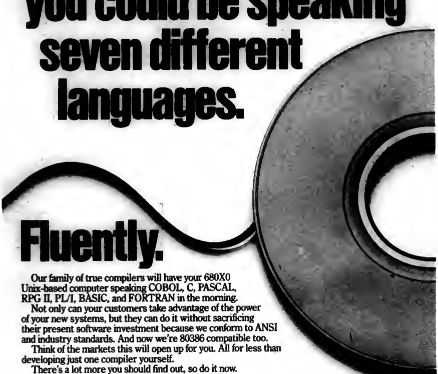
Zellers now has its AT-based system up and running. The company is, in fact, planning to eventually install a second Xenix-based AT at each store. The second system would link to the first via a LAN to provide fault-tolerance functions. It would also relieve the first system of day-to-day accounting and bookkeeping chores. To make it possible for each store manager to do those accounting tasks on the local machine, Zellers is looking at Xenix-based Lotus Development Corp. 1-2-3 work-alikes.

When Zellers purchased an SNA implementation from the Santa Cruz Operation, it also picked a side in an ongoing debate — a debate that significantly affects the business of linking IBM systems with larger Unix machines.

Everyone agrees that discovering a standard communications protocol for Unix and IBM machines is the ticket to success. The arguments start on who should be doing the work. As a rough division, the two camps are composed of those who feel that Unix machines must take on an SNA protocol and those who feel that IBM users must install a bit of the Transmission Control Protocol/Internet Protocol (TCP/IP), Unix's standard file transfer and electronic mail facility.

Simply because of Big Blue's power, the SNA camp has the clear advantage in terms of numbers. Good SNA implementations for Unix machines are available from several sources. For example, Systems Strategies, Inc., located in New York, markets a number of communications products with the general heading of CSNA. Written in C, these provide varying degrees of SNA functionality. The most complete is CSNA/LU6.2, which is a full implementation of IBM's LU6.2 protocol.

Another, very strong player



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in the SNA game is Communications Solutions, Inc. of San Jose, Calif. The firm has been a supplier of IBM communications facilities since 1979.

In November 1985, Communications Solutions introduced Access/SNADS, a Unix-based implementation of IBM's SNA Distribution Services (SNADS) architecture. A SNADS product provides for data management within an SNA communications environment.

But, at the moment, the fraternity of SNADS sellers is a very limited club. As of 1986, even IBM was not a member.

Meanwhile, if SNA has the advantage of a Big Blue blessing, then TCP/IP has the moral fiber that comes from a dedicated user group. Because it has been around a long time, because whole generations of programmers have learned to use it and because the federal government and the U.S. military have both supported it, TCP/IP has emerged as a respectable alternative method of linking Unix and IBM systems.

One TCP/IP proponent is Stephen Tolchin, technical director of operational and clinical systems of Baltimore-based Johns Hopkins Hospital. Recently, Tolchin faced the quintessential MIS problem: "We had a collection of machines that didn't talk to one another very well," he says. His firm has 10 Digital Equipment Corp. PDP-11s, two Unix-based supermicros and two IBM mainframes.

Hardware homogeneity was out of the question. "Buy IBM?" Tolchin scoffs. "The 10 PDP-11s are owned by 10 different, independent departments. You're just not going to tell them what to do." And, software homogeneity was no more likely. "The data base management system people would like to have you go out and buy their product and put it in everything from micros to mainframes. But you can't do that. You've got existing applications that you're just not going to sacrifice," Tolchin says.

So, Tolchin set out to create a bridge between his diverse machines and operating systems. First, he produced a distributed application using the Ingres DBMS from Relational Technology, Inc. of Alameda, Calif. Second, he implemented TCP/IP on his mainframes. "Our goal," he says, "is to make the IBM mainframe a network citizen under TCP/IP. . . . It seemed better to teach it TCP/IP than make every other machine in the network talk SNA."

So, Unix and IBM hybrids are possible. But they are monsters of a sort, not because they are destructive but because they are unusual. The question, though, is whether MIS people should bother with these creatures.

The answer may be back at Zellers, with its Xenix-based ATs managing networks of intelligent cash registers.

The Zellers system presents an interesting kicker. Unix here is playing its traditional role of departmental operating system. It is managing groups of single-user systems and providing gateways into the corporate mainframe. But, it is also acting as the operating system of a very *personal* computer. The firm's ATs are essentially acting as MS-DOS systems, except that they have Unix's multitasking and communications facilities.

Thus, they provide MIS officers with rather good evidence that, at least as far as corporate data processing networks are concerned, Unix's real role may actually be that of a personal operating system for single-user machines. This means that espousing Unix as the PC operating system of choice could have significant advantages for MIS directors — both in terms of technology and politics.

In technology, the advantage of Unix is that it fits what seems to be the historical pattern of PC evolution. It provides multitasking and multiuser functionality at a time when Microsoft has proved reluctant to add those characteristics to MS-DOS. Unix is also capable of exploiting the full potential of 32-bit systems based on the Intel 80386 microprocessor, which MS-DOS clearly is not.

> ”
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> *If SNA has the advantage of a Big Blue blessing, then TCP/IP has the moral fiber that comes from a dedicated user group.*

But, it is in terms of the politics that Unix and Unix/IBM hybrids could be most useful to MIS. No one doubts that micros and mainframes will ultimately be integrated. MIS has much to lose or gain on how that integration comes about. If the links grow from below, from micro managers and their PCs, then the profession of MIS will once more find itself forced to become a client, adapting its mainframes and its data to fit the requirements of desktop systems.

If, on the other hand, MIS officers establish the links themselves, then they could find themselves in a strong position. And, hybrids could be their weapon. By aggressively selling Unix to end users as a technically superior alternative to MS-DOS while making certain that Unix desktops are tightly integrated into hybrid data networks, MIS officers can undercut the power of MS-DOS-based, stand-alone machines. They might, finally, bring the management and managers of micros and PCs under their own authority.

Tucker is Computerworld Focus *features editor.*

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CIRCLE READER SERVICE NUMBER 215

PRODUCT INSIGHT

PAUL SCHULENBURG

DBMS And 4GLs:

·BY·REBECCA·HURST·

Comparing data base management systems and fourth-generation languages (4GL) is not as easy as comparing apples and oranges. Most DBMS and 4GLs were introduced in the mid-1970s as separate products. But unlike apples and oranges, they have since begun merging into a new hybrid. Consequently, many DP and MIS professionals find that their attempts to distinguish between the products are confusing at best.

Many DBMS systems and 4GLs can serve overlapping functions, but they are not entirely interchangeable. As a result, the DP professional looking for the right software often walks a tightrope. The 4GL-based products may not meet a corporation's needs for complex file structures, backup and recovery. The DBMS may be overkill for companies or departments that require simple data filing systems.

First there were DBMS systems and 4GLs, but DP and MIS managers with DBMS wanted an easier way to create data base files and applications. Language vendors responded by providing interfaces to popular data bases and by adding data base functions to their 4GL products. Spurred by the success of the 4GL companies that provided DBMS interfaces, data base vendors began introducing their own 4GLs.

In fact, several vendors surveyed by *Computerworld Focus* indicated that they offer hybrid products. Since the 1970s, firms such as Information Builders, Inc. and D&B Computing Services Co. have marketed software products that combine a 4GL with data base management capabilities. These products have become more DBMS-like during the years, analysts agree. Still, these tools also work with traditional DBMS such as Datacom/DB from Applied Data Research, Inc. and IDMS/R from Cullinet Software, Inc.

In turn, vendors that primarily supply traditional DBMS indicate that they have introduced 4GLs or even combination DBMS/4GL products. For example, ADS/Online is Cullinet's 4GL offering. Products such as Unify Corp.'s

Splitting The Difference

Accel resemble combination offerings such as Information Builder's Focus and D&B's Nomad2. Then, too, firms such as Informix Software, Inc. provide 4GLs layered on top of their data base engines.

Many of the resulting products look perplexedly similar, and marking their differences and optimal uses has been a problem for users and vendors alike. The confusion is a vicious circle, according to Tom Melchiorre, a software analyst at Datapro Research Corp. in Delran, N.J. "Vendors aren't quite sure where they are going, so they're trying to cover all the markets," Melchiorre explains. "Customers aren't sure whether a 4GL is a language or a 4GL DBMS."

However, there are distinct characteristics between 4GLs and DBMS, several analysts agree. By using these to identify the products and their strengths, DP managers can examine which type of software is most likely to meet their needs.

In defining programming languages, many analysts eschew the term "fourth generation." Some languages are more fourth generation than others, Melchiorre says. According to Shaku Atre, president of Atre Consultants in Rye, N.Y., no true 4GL yet exists. However, like Melchiorre, Atre says she believes that some languages have more fourth-generation qualities than others, and she has devised a point scale running between 3.0 and 4.0 to explain how closely products approach a fourth-generation status.

Beginning with the general premise that languages like Cobol and PL/1 represent third-generation technology, Atre rates the on-line application development language for IBM's IMS data base a 3.25. Software AG of North America, Inc.'s Natural, Applied Data Research, Inc.'s Ideal and Cincom Systems, Inc.'s Mantis fall into the 3.5 group of languages. Products such as On-Line Software International, Inc. Ramis II, Information Builders Focus and D&B Computing Nomad2, often referred to as 4GL data bases, are part of the 3.75 language group, Atre says.

One quality of most 4GLs is that they take on the characteristics of data bases. Even so, 4GLs are still languages, analysts agree. "The emphasis of 4GLs is on manipulating language," explains Herb Gepner, a senior associate at Datapro. A 4GL is a language processor that interprets English language statements into commands.

Because of their power, 4GLs can also be used to create files that can be grouped into meaningful conglomerates. By contrast, Gepner says, the emphasis of a DBMS is on data structure. "It has much more powerful manipulative capabilities that can handle extremely large, structured data bases."

To clarify whether a product is a DBMS or a language, Atre has devised the following nine-point checklist. If a product fails to meet all of the list's criteria, it is not a full data base management system, she maintains.

A DBMS must have a data model, which provides the underlying structure of the system.

A DBMS must have the ability to create physical files.

A DBMS must have a data definition language (DDL). The DDL describes the data in a language that the DBMS will understand.

A DBMS must have a data manipulation language (DML). A DML manipulates the physical files of data within the data base.

A DBMS must have a data control language (DCL). The DCL describes backup and recovery for the DBMS if it should go down during transmission or in the middle of a program.

A DBMS must have system installation capabilities, which include recovery, restart, space redundancy and reorganization.

A DBMS must have the ability to program in the host language.

A DBMS must perform data communications. Data communications is important for data transfer to a DBMS that resides on another computer. One form of communications is CICS, which manages terminal and transmission line access.

A DBMS must have a data dictionary or directory. The data dictionary or directory is similar to a road map in the DBMS, Atre says. It checks authorization and records file updates.

The areas in which combination DBMS and 4GL products such as Focus, Nomad2 and Ramis II are weak are the data dictionary or directory and system installation, according to Atre. Therefore, she asserts, they are not full DBMS.

System installation, in particular, is a critical element. "Without some kind of recovery and backup, the best data base management system is useless," she maintains. "What good is a data base if it's not up and running?"

More important than the characteristics that define DBMS and 4GLs are the types of solutions that the products provide. However, it is difficult to identify solutions without defining the needs that they address. "When customers consider a DBMS or 4GL, they have to ask what the needs of their operations are," Datapro's Melchiorre says.

MIS must assess needs of end users

MIS needs to look at its end users and the way they handle data, according to Anita Massey, product manager at Unify. "People will assume they're out for a high-performance product, but they'll base their decision on how fast an SQL query command is executed," she says. However, a query has to be performed in context. "If 60 users will be running data base applications at the same time," Massey explains, "the product should be tested under similar conditions."

To help MIS professionals assess their needs, Unify has printed an outline of criteria that fall into four categories: user description, data description, applications and system requirements. Under user description, companies should consider the types of users who will use the system and how they will access it, the number of users, the degree of data sharing and unscheduled use anticipated, response time and data access and control.

With regard to data description, MIS or DP managers should question both the present and future volume of data to be handled, the viability of the data structure and items, the quality and timeliness of the data, the sensitivity of data loss or damage and the transaction rates.

In the area of applications, users should look at the language they plan to use, the product's documentation and the portability of the software. Finally, in terms of system requirements, managers should consider the available memory, system administration, any disruptions in service, the cost of the system and the installation time. By analyzing these various requirements, Massey suggests, it will be harder to be swept away by individual product features.

While DBMS and 4GLs do not fit neatly into categories, there are some general ways in which these products address the requirements of various user environments.

The power of a DBMS is optimized for a production environment in which data integrity is critical and there are hundreds of thousands of transactions per day, Atre says. Melchiorre concurs, but he adds that the best software environment is one in which the applications are well defined and relatively unchanging.

The software best suited for DBMS includes those applications that serve as the nucleus of the organization, according to Ed Acly, a senior software analyst at International Data Corp., located in Framingham, Mass. These include programs such as accounts payable, accounts receivable and order entry.

However, using a DBMS in some environments is like shooting a moose with an elephant gun, Datapro's Gepner says. For companies or departments with simple data management requirements, a 4GL may provide all the necessary capabilities. A 4GL also has the flexibility to handle the personal or temporary application requirements of a dynamic office with changing conditions, Melchiorre suggests. In addition, corporations often use a 4GL and DBMS together to provide complementary functions.

Whether a manager is planning to purchase a DBMS, a 4GL or both, it is important to recognize that these products were not designed to be used extensively by end users. The best 4GLs are application developer friendly, Atre explains. Tools such as Informix Software's Informix-4GL were designed for application builders, according to Laura King, Informix vice-president. Even though fourth-generation products have friendlier interfaces, they are still designed for programmers, not end users, she says.

Although 4GLs were designed to enhance programmers' productivity, many favor third-generation languages to develop DBMS applications. "Fourth-generation languages eat up computing resources," Datapro's Melchiorre claims. Technical users and programmers will often bypass menus and simple English instructions and go to simple command codes, he says.

'I haven't written one line of C'

Other programmers like Mark Sobell, president of Sobell Associates, an application consulting firm in Palo Alto, Calif., argue that 4GLs can be used with a DBMS without degrading the speed of the system. It is also possible to write applications using a 4GL without turning to a third-generation language for subroutines, says Sobell, who has been developing applications for clients with Informix-4GL for 1½ years. "In that time," he says, "I haven't written one line of C code."

As a result of his experience with combination DBMS/4GLs, Sobell also questions the distinctions people are attempting to place between DBMS and 4GLs. "Any application can benefit from a fourth-generation language," he asserts. "You can do software prototyping, or you can build a production-quality application. There's no reason to go back to a DBMS."

DBMS and 4GLs have taken on many of each other's characteristics, Melchiorre agrees. But while that trend will continue, vendors will continue to offer separate products to DP and MIS professionals. "The fact is that some people will want a 4GL in their DBMS, and some people will not."

Hurst is a Computerworld Focus *senior writer.*

The Secret Of A Successful DBMS: A Blend Of Technology, Management Issues

Data processing managers planning to purchase a data base management system may feel they need a scorecard to track the many available products. However, managers are more likely to succeed if they go beyond product details and ask how the DBMS will fit into their corporate game plan.

The use of one particular DBMS product over another does not affect the success of a user installation, concluded a report from International Data Corp. (IDC) of Framingham, Mass. All the systems had their share of successful and less than successful users. But, while the quality of the DBMS is not a strong factor, the number of DBMS systems is.

The most successful users surveyed by IDC reported a preference for using a single set of data bases for both production and information center processing.

System development tools key

Other factors that had an impact included the techniques and tools used in system development and the resources used to integrate a DBMS system into the work environment.

The most effective organizations made a markedly greater use of fourth-generation languages and application generators, while less successful ones made heavier use of third-generation languages, the study said. Notably, the troubled installations reported an inability to deliver affordable, flexible applications that meet users' requirements.

The implication is that more successful in-house developers may be spending fewer corporate hours and dollars developing applications. Consequently, they may also have more time to address backlogged requests for more job-specific software.

Application development techniques also affect how successfully a DBMS is used. The effective organizations used prototyping more frequently than did less effective companies. Other popular techniques among all survey respondents included stuctured analysis, design and programming and quality assurance testing. The use of these older techniques overshadowed the use of newer approaches such as process and function modeling and data modeling and analysis, IDC reported.

The IDC study also noted several management issues that contributed to winning DBMS installations. Among more successful organizations, senior management was more committed to finding an effective data management solution, and the data processing budget constituted a larger percentage of the total revenue. In fact, the IDC survey revealed a consistent correlation between the revenue spent on DP and the relative effectiveness of DBMS installations.

Devote more staff to development

In addition, the most successful companies devoted a substantially greater percentage of their MIS or DP staff to applications development.

Finally, the most effective organizations reported that they have been able to make information available on a responsive basis to all classes of users. They have also reported the ability to provide enhanced data security and privacy.

However, even these successful companies have not been able to provide all the answers. Both they and their less successful counterparts reported political problems that stemmed from users having to relinquish ownership of their data.

— Rebecca Hurst

SPECIAL SECTION: UNIX

Blending MS-DOS And Unix

DAVE RIDLEY

· BY · PHILIP · J. · GILL ·

The new wave of microprocessors has left in its wake added power in personal computer hardware. Many PCs are unable to take advantage of these more powerful chips because of limitations in today's standard operating systems. MIS and users must look for a solution to bring the force of the new generation of PCs to desktops.

The operating system level is ripe for change. The first version of Microsoft Corp.'s MS-DOS was essentially an upwardly compatible, 16-bit version of Digital Research, Inc.'s CP/M, the de facto standard operating system for 8-bit microcomputers. That was good for the first IBM Personal Computer, based on the Intel Corp. 8088 8-bit chip that looked and performed like a 16-bit machine.

However, more powerful members of Intel's chip family have pushed the power of hardware far beyond the capabilities of MS-DOS. New operating system features are required to harness that power. This is especially true of the recent wave of Intel 80386-based machines, the first of which, the Compaq Computer Corp. Deskpro 386, was joined by almost 20 other products at Comdex/Fall '86 in Las Vegas.

For the time being, many of these vendors are planning to offer Microsoft's Xenix System V, an enhanced version of AT&T's Unix System V. These companies need the Xenix option because they realize that the benefits of running MS-DOS on a 386-based machine are dubious. Moreover, MS-DOS is incapable in its current form of taking advantage of some of the advanced hardware features of the 386, such as extended real and virtual memory and virtual 8086 modes. In short, there is a strategic and, some might say, critical, operating system gap between current-generation PCs based on 8088 and 80286 chips and next-generation PCs based on the 386 chip.

Unix is not without its drawbacks — it does not run any popular PC-based applications software programs such as Lotus Development Corp. 1-2-3, Microsoft Word and Multiplan and more. It is, however, fully capable of taking advantage of some of the very same 386 features MS-DOS is not, such as large memories, both real and imagined (or virtual).

There is a third option, one that is gaining more and more credence every day. That is, why not unite MS-DOS and Unix into a single operating environment?

Such a merger seems natural. After all, each offers many of the capabilities that the other sorely lacks. From its inception, MS-DOS was and is a fairly base-level, single-user, single-tasking operating system for PCs. In contrast, Unix was intended from the start to be multiuser and multitasking with strong integrated networking capabilities.

The first products that sought to marry the MS-DOS and Unix worlds came on the market long before the Intel 386 chip, before even the general availability of PC AT clones based on the 286 microprocessor. In large part, these products were part of an offensive strategy, a means of positioning Unix systems as coexisting rather than rivaling MS-DOS systems while opening up new horizons to MS-DOS users — more powerful processors, more main memory, larger disk capacities, networking, file and disk sharing and electronic mail between previously stand-alone systems. In other words, some clever marketeers had devised a way they thought they could sneak Unix systems in through the back door.

These earliest MS-DOS-to-Unix bridge products keyed in on one strategic flaw in the PC market: the lack of viable networking standards and options. The earliest MS-DOS/Unix bridge products, which began appearing in the early '80s, sought to tie stand-alone PCs together in starlike, local-area networks (LAN) in which either a Unix-based supermicro or mini served as a central file server. Not a bad positioning, considering the confused and uncertain state of PC networks at the time. Many users hesitated to commit to these products even though they needed to share data and expensive peripherals between individual PC users.

These MS-DOS-to-Unix bridge products offered very basic capabilities, such as permitting PCs to act as intelligent terminals to Unix-based supermicros and allowing them to use the multitasking, multiuser and communications capabilities of the Unix-based supermicros. In addition, the offerings served as central points for communicating with other PC users that might also be attached as well as with those users who merely had a dumb terminal on the Unix system.

> *It is Unix users who want access to MS-DOS applications and not MS-DOS users that want multitasking who are driving the MS-DOS/Unix merger.*

Among the first of these products was Touchstone Software Corp.'s The Connectables, which includes both PCworks, PC-based software, and Unihost, Unix-based software. The Connectables also allows IBM PCs and Apple Computer, Inc. Macintoshes, through a third product called Macline, to serve as workstations to a Unix-based host. Working together, the PCworks and Unihost software provide for file transfers from the PC workstation to the Unix host and vice versa as well as for E-mail and Digital Equipment Corp. VT52 and VT100 terminal emulation. Actual processing can be distributed between the PC or the host system. When operating in this mode, the Unix system performs I/O for the PC.

Locus Computing Corp. is another early pioneer in the MS-DOS-to-Unix bridge product arena. Today, however, it is probably best known for its work on what are considered to be the most sophisticated MS-DOS/Unix products available, Merge 286 and Merge 386, which enable MS-DOS applications to run as tasks under a Unix System V host operating system.

Locus started out a few years ago to build a much less ambitious, though still technically intriguing, bridge product that sought to marry MS-DOS workstations and Unix hosts in a LAN environment. It did so quite successfully with a product now called the PC Interface. The Santa Monica, Calif.-based software house says that its OEMs have sold more than 100,000 copies.

Like The Connectables, PC Interface entails both MS-DOS-based workstation software and Unix-based host software. Unlike The Connectables, which offers a direct connect between PCs and Unix hosts, the PC Interface software components work in tandem over a LAN, usually an Ethernet LAN. To the MS-DOS-based workstation, PC Interface software makes the Unix host look like a very large disk drive. Applications are processed locally on the PC, though PC applications can take data from either the local disk or the larger Unix system disks.

A third early MS-DOS-to-Unix bridge product was Synchrony, from Cosi, Inc. of Ann Arbor, Mich. Synchrony makes a PC look like a DEC VT52 or VT100, IBM 3101 or Tektronix, Inc. 4010 graphics terminal to a Unix host.

One of the sophisticated features of Synchrony is that even when a user is logged on to his PC as a Unix terminal, MS-DOS commands can still be executed through special commands. In addition, the user can direct program output from host to PC or PC to host and can also direct the host to run a program on a PC other than the one from which the command originated.

The Santa Cruz Operation, Inc.'s Xenix-Net is not strictly an MS-DOS-to-Unix bridge product in the same way the first three are. In fact, it is really a networking product, based on a prepackaged version of Microsoft's Networks for Xenix product that permits both MS-DOS-based PCs and Xenix-based microcomputers to work together and communicate with each other over a LAN.

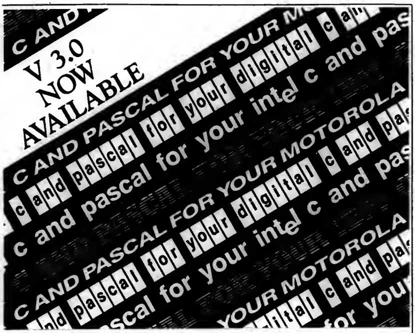
One of the major, substantive differences between Xenix-Net and the other products is that it has a distributed file system that integrates all Xenix and MS-DOS servers on the network into a single system, according to the Santa Cruz, Calif.-based firm. The earlier bridge products merely link MS-DOS and Unix systems together for sharing resources, processing power and, occasionally, E-mail. File systems are not integrated in any way.

Xenix-Net is probably a logical solution for users who are hesitating to commit to either a PC LAN or a multiuser Unix system as a departmental computing solution. It enables users to have both, without having to choose one or the other.

MS-DOS and Unix at the desktop

The earlier MS-DOS-to-Unix products were good as far as they went, though they fell short of the ultimate goal of integrating the MS-DOS and Unix worlds into a single environment. That task has been left for what might be called second-generation MS-DOS/Unix merger products.

In general, these second-generation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CIRCLE READER SERVICE NUMBER 211

MS-DOS/Unix merger products aim to do considerably more than permit MS-DOS-based PCs to serve as network workstations attached either directly or across a LAN to Unix-based hosts. Indeed, these products provide an integrated MS-DOS/Unix environment in a single desktop workstation in which the facilities of both operating systems are available to the user even though they share a single, common, integrated file system.

Locus Computing's Merge 286 is marketed by AT&T as the Simul-Task facility for its PC 6300 Plus. Simul-Task was developed jointly by Locus and AT&T and includes some AT&T proprietary hardware. The Merge 286 software, however, is available to other OEMs directly through Locus.

Merge 286 and its newer sibling, Merge 386, provide for the concurrent operation of MS-DOS and Unix on a single 286-based or 386-based workstation, respectively. The Merge products present either a Unix or MS-DOS environment to the user. Regardless, both environments share a single, unified file system so files can be called up transparently from either mode. The Merge products enable users to run one or more MS-DOS applications as though they were Unix processes.

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> *Ultimately, however, something totally new — neither Unix nor MS-DOS — will have to emerge.*

According to Mike Lewis, marketing manager for Locus, the major difference between Merge 286 and Merge 386 is that Merge 386 allows users to run multiple MS-DOS applications concurrently at both the console and remote terminals. With the 286 version, MS-DOS applications could only run at the console terminal.

Lewis says that current OEMs for the Merge 286 products include AT&T and Microport Corp., a Unix porting house in Santa Cruz. No OEMs for Merge 386 have been announced. Merge 386 is scheduled to ship by year's end.

Locus is not alone in its endeavors. Currently, it has competition coming from VP/IX 86, an outgrowth of a joint development agreement signed last fall between Interactive Systems Corp., a Santa Monica Unix porting house, and Phoenix Technologies Ltd. of Norwood, Mass., a PC read-only memory BIOS firm.

VP/IX provides essentially the same capabilities as the Locus products except that a version will be available for the Xenix/386 operating system, according to a recently signed agreement between Microsoft and Phoenix. This pact, according to a Phoenix spokesman, will give VP/IX access to the largest body of users in the Unix community. Xenix is by far the preferred version of Unix on microcomputers.

The spokesman adds that it is Unix users who want access to MS-DOS applications and not MS-DOS users that want multitasking who are driving the MS-DOS/Unix merger. He says some MS-DOS users will buy VP/IX, but only those "who can't wait for IBM and Microsoft."

Some people, however, might disagree with the spokesman's assessment. Clare Fleig, director systems research at International Technology Group of Los Altos, Calif., says that many people simply don't realize that the 286 and 386 chips are incompatible with each other — the result of fundamental architectural differences between the 16-bit 286 and the 32-bit 386.

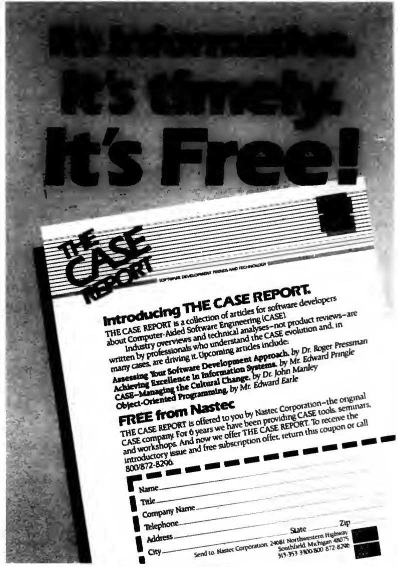
For Fleig, further convergence of the two operating systems is not only a probability but a necessity brought on by the features and requirements of the 386's 32-bit architecture. Fleig says an assessment she has made of future operating system requirements for 386-based micros has identified six critical features the new operating system must do well. The systems must be single user, multiuser, multitasking and have 32-bit memory management, networking and dual operating system support.

Unix/MS-DOS an interim solution

Of these six features, Unix/Xenix excels at four, according to Fleig's summation — multiuser, multitasking, 32-bit memory management and networking. MS-DOS, on the other hand, excels at only three — single user, multitasking (via Microsoft Windows or another upcoming enhancements) and networking. Fleig says both fall far short of the ultimate market requirements. In the meantime, Fleig suggests that Unix/MS-DOS may well be a viable interim solution for many users.

Ultimately, however, something totally new — neither Unix nor DOS — will have to emerge. "There has to be a new option," she maintains. "It can be called MS-DOS 230, but it's not going tu be MS-DOS as we know it." And the same applies to the Unix side as well. "The new operating system will undoubtedly have Unix flavoring," she adds, but it will not be the Unix of today. ■

Gill, a seven-year veteran of computer journalism, is the former editor in chief of Unix/World Magazine. *He is currently a free-lance writer based in San Mateo, Calif.*



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COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

SPECIAL SECTION:
UNIX

The Move To Fault Tolerance

DAVE RIDLEY

·BY·ANNE·LOVETT·

"Now that the world relies on computers, it needs computers to rely on," quip proponents of fault-tolerant systems. In the last 20 years, user expectations of computers have increased. Batch processing used to meet most users' needs, but the advent of enhanced communications and the accompanying "Instant Information Age" have created a large market for on-line transaction processing (OLTP). In turn, the increasing need for instantaneous data integrity in OLTP has spawned the need for fault-tolerant systems.

Currently, a surprisingly small percentage of OLTP needs are fulfilled by fault-tolerant systems. Of an OLTP market estimated by many at $30 billion annually, only 5% to 10% has been captured by the fault-tolerant vendors; the rest belongs to traditional hardware vendors such as IBM, Digital Equipment Corp. and Prime Computer, Inc. Of the approximately $2.5 billion to $3 billion fault-tolerant market, a reported $1 billion belongs to the fault-tolerant hardware vendors — Tandem Computers, Inc., Stratus Computer, Inc., Tolerant Systems, Inc., Sequoia Systems, Inc. and others.

The remaining $1.5 billion to $2 billion is attributed to systems houses and value-added resellers (VAR), which are enhancing fault-tolerant machines and even creating new fault-tolerant machines by pairing computers such as DEC PDP-11s and writing custom software.

Have user demands of vendor independence guided the OLTP and fault-tolerant markets solidly to Unix? Not exactly. Of the $1 billion hardware vendor segment of the fault-tolerant market, an estimated 9% to 12%, or $90 million to $120 million, belongs to Unix fault-tolerant vendors. This represents 0.3% to 0.4% of the total OLTP market.

To determine the suitability or viability of Unix in fault-tolerant systems, first consider the attributes and uses of fault-tolerant computers. These computers were designed with redundant hardware, which provides backup for every component whose failure could cause the system to stop, and special software, which protects against system failures by detecting when a component has failed and activating backup.

To date, the area of demand for fault-tolerant systems has been transaction-based, time-critical applications. The systems' areas of use include finance, airlines, telecommunications, retail point of sale (POS), government/defense and manufacturing. Data base integrity as well as reliable, speedy data communications that use a variety of protocols are extremely important.

With this in mind, fault-tolerant Unix systems at first seem to be a case of jamming square pegs into round holes. Unix is deemed unsuitable for fault tolerance for a multitude of reasons. The most frequently mentioned problem is its reputed habit of whimsically dropping files — not an insignificant shortcoming for a market demanding a high degree of instantaneous data integrity.

Standard Unix is also deficient for fault-tolerance in the area of terminal handling. Transaction processors, including fault-tolerant systems, generally use IBM 3270 terminals. Unix was built for one-character-at-a-time I/O over asynchronous lines and, therefore, does not provide robust support for these block-mode devices. While these criticisms are reasonable, none of them precludes an internal architectural change to Unix to make better use of fault-tolerant hardware.

The approach of Tolerant Systems, one of the few Unix fault-tolerant firms that utilizes Unix as the primary operating system in its machines, illustrates how to attempt to fix the problems.

Tolerant spent $10 million and 100 man-years modifying Unix from a call-based to message-based system. To make Unix a commercially viable fault-tolerant operating system required a safe allocation system, ensuring that files would not be lost in case of a power failure. The firm adapted Unix's file system by adding begin/end transaction markers so that a record of transactions would tell the system where to pick up in case of an interruption. To alleviate the one-character, asynchronous I/O problem, Tolerant added standard protocols such as IBM Systems Network Architecture and X.25.

The company made many other changes to Unix, including giving its version of Unix the ability to deal with Unix files located anywhere on the system, not just with those that are resident in one particular Unix machine. To improve throughput further, Tolerant carved up Unix and placed the pieces on different processors, isolating the communications capabilities on one processor. Even with all these modifications to Unix, the company claims that a high degree of compatibility with standard Unix exists and that data can still be shared with dissimilar operating systems by utilizing standard communications protocols.

As an increasing number of vendors create Unix fault-tolerant systems, an equally rising number of multiprocessing Unix versions are produced. Companies in the Unix fault-tolerant market are concerned with the lack of Unix standards in transaction processing and real-time, guaranteed response systems. Many say they believe that the X/Open standard-making consortium, composed of European and U.S. vendors, is the furthest along in addressing these areas, compared with the U.S. standards committees, which have not even begun to address issues for transaction processing and real time.

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> *Likened to the user demand for local-area networks several years ago, interest in fault-tolerant systems is beginning to accelerate.*

The Unix fault-tolerant vendors hope that X/Open will lay the foundations and that the U.S. groups will pick up on its efforts. Technical problems are viewed as relatively straightforward and solvable; legal problems, however, may be a real stumbling block.

To alleviate confusion and not add a greater burden to existing Unix standards groups and committees, it is likely that there will be a bifurcation of Unix standards, with one version for fault-tolerant/multiprocessing Unix and another for single-processor Unix.

Another concern focuses on whether, after all the alterations to mold Unix into a commercially viable, fault-tolerant operating system, Unix programmers will still recognize it. Experts at AT&T claim that while a new Unix tool set for multiprocessing environments will be required, programmers can be readily retrained. Other experts claim that most of the changes are transparent to programmers.

The success of Unix fault tolerance is tied to the individual successes of fault tolerance and of Unix as well as to the suitability of such a marriage. Likened to the user demand for local-area networks several years ago, interest in fault-tolerant systems is beginning to accelerate.

The ability to program in only one environment — for mainframes, minicomputers, transaction processors and intelligent workstations — will help fuel Unix's success in all these markets. Furthermore, as prices decrease and performance increases, use of fault-tolerant systems will become more justifiable in many more applications.

The use of fault tolerance has been pioneered in six industry segments:

■ Brokerage — stock exchanges and interfaces to stock exchange systems. If the system fails, orders and executed trades could be lost, resulting in loss of business and possible lawsuits. In the deregulation of the London Stock Exchange, Stratus figured prominently, selling major systems to 11 large brokerage houses in London so that the in-house systems could communicate with the stock exchange's system.

■ Banking — principally automatic teller machines and electronic funds transfer networks. If the system goes down, the financial institution can face heavy penalties for transfers not being processed on a timely basis.

■ Manufacturing — especially shipping and warehousing. At the European Container Terminus in the Netherlands, overhead cranes load semi-tractor trailers onto ships. If the Stratus system goes down, no loading can occur, resulting in lost time and money.

■ Telecommunications — principally in billing. Companies cannot afford to have the system go down because long-distance calls would go unbilled. Communications Satellite Corp. (Comsat) provides ship-to-shore communications and, at its ground station, links the calls to ground-based carriers such as AT&T or MCI Communications Corp. Tolerant machines are used in the ground stations, controlling call setups, timing the calls, processing the billing and monitoring and controlling reconnections.

■ Retail POS systems — especially credit authorizations. If the system fails, customers wait or the store waives the necessity for authorization, assuming the risk.

■ Government — particularly in the area of defense.

The brokerage industry provides a

good illustration of the changing utilization patterns for fault-tolerant machines. There, the use of fault-tolerant machines is widespread and expected to increase rapidly. The advent of 24-hour, seven-day-per-week global trading would create enormous demands on traditional data processing systems, making fault tolerance even more attractive.

As prices drop, fault-tolerant systems will reach end users in the brokerage industry. While fault-tolerant machines currently are used in nearly all aspects of trading, in most installations, the fault-tolerant machines are used for gathering, storing and disseminating time-sensitive data.

Data processing (financial reporting, customer statements and so on) is usually performed on mainframes. Calculations such as current portfolio valuations are typically performed on brokers' workstations. Stratus offers interfaces to IBM Personal Computers and compatibles so users can take advantage of fault-tolerant file servers and download data on the PC for analysis.

"Currently these calculations are performed on non-fault-tolerant machines because the task is not deemed mission critical. In the future, more and more tasks will be classified as critical as the significance attached to these tasks grows," observes Jay Krone, Stratus program manager for product planning.

The Unix fault-tolerant bandwagon

To date, none of the large computer vendors has jumped on the Unix fault-tolerant bandwagon. In fact, IBM, with its Stratus deal, is the only big name to enter the fault-tolerant marketplace. This will soon change, however, with fault-tolerant pioneer Tandem's entry into the Unix segment of this market.

Furthermore, several traditional computer manufacturers are itching to join the fray on their own or more likely with the help of the young, fault-tolerant vendors, nearly all of which run Unix on their machines. All these small firms are rumored to be experiencing financial difficulties, which makes them even more willing to deal with the giants.

Tandem views fault tolerance as a requisite for its defined market, OLTP. Its proprietary, message-based operating system, Guardian, runs on all its machines. The architecture, geared to fault tolerance and to networking, enables many systems to be tied together and offers users a flexible growth path.

The company sells into a variety of OLTP applications, principally for larger, Fortune 1,000 customers hooking systems together. Smaller industry segments are handled by Tandem's Alliance Program, basically a VAR network with hundreds of software houses.

Classic users of Tandem machines fall into the industry segments detailed above, with brokerage and banking being Tandem's largest segments. Tandem claims to have installations in most of the major stock exchanges around the world.

As the undisputed leader in fault-tolerant systems, Tandem has been conspicuous by its absence in the Unix segment of this market. The company has seen a demand for fault-tolerant Unix systems but will not indicate its plans. Tandem prides itself on its strict adherence to standards, and as a Tandem spokesman stresses, "Unix is another standard, and if our users want it, we'll offer it."

Rumors have circulated that the company is working on two Unix offerings, code-named Quail and Falcon. In addition, Tandem announced a strategic business alliance with Altos Computer Systems, Inc. but is keeping very quiet about the details. Either on its own or with Altos, Tandem will bring out a fault-tolerant Unix system in the near future for the low end of the market.

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> *Several traditional vendors are itching to join the fault-tolerant fray on their own or more likely with the help of the young, fault-tolerant vendors.*

Stratus says it believes, perhaps self-servingly, that the fault-tolerant market is divided into two camps: its approach of heartbeat fault tolerance in which the computer *cannot* go down; and all others, with Stratus claiming that even Tandem machines can hiccup — maybe for a millisecond — because of a software-only approach. According to Stratus, these other vendors have high availability rather than fault tolerance.

Stratus runs AT&T Unix System V.2 in a host/guest implementation similar to IBM's IX/370. The host is Stratus's proprietary operating system called VOS. The two operating systems share the same VOS kernel, and the VOS and Unix shells run above the kernel. The Unix product, called Stratus/USF, reportedly runs fairly slowly. Because USF is weak in process creation (and Unix relies on process creation for nearly everything it does), the speed of the user interface is affected.

Stratus's distribution agreement with IBM, wherein IBM sells a Stratus machine as its own System/88, has given both the fault-tolerant market and Stratus enhanced credibility. The company classifies IBM as an OEM, bulk shipping to IBM and reportedly not even knowing how many systems have been sold. IBM

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provides all service for the machines, licensing Stratus's customer service software called Phone Home (in the case of a failure or problem, the machine automatically calls the service center).

While IBM has the option of licensing Stratus/USF, it has not done so to date. IBM has not clearly embraced the promulgation of Unix as a standard for a variety of reasons, including the basic fear of losing its control over the customer. Even Big Blue, however, reacts to market demand and, thus, can be expected to provide its customers with a Unix fault-tolerant system if demand is sufficient. Rumors of IBM development of fault-tolerant systems abound, although IBM is not expected to announce such a machine in 1987 or 1988, most likely waiting to evaluate its successes with System/88 first.

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> *With the probable exception of IBM, those large vendors that elect to develop a fault-tolerant system internally will choose Unix for the operating system.*

Tolerant chose to use Unix as the primary operating system in its fault-tolerant system because it was clear to the company that the cost of developing a proprietary operating system, including the necessary tools and compilers, would be prohibitive.

The firm is said to have experienced severe financial difficulties. Tolerant claims that another round of financing from both its original backers as well as some newcomers has put the company back into stable financial shape for the time being. Clearly, an IBM/Stratus-like deal for Tolerant would be a significant boost for the company and would fit nicely with its business plan of highly leveraged selling to avoid end-user sales and service. Tolerant has had discussions with a number of large computer vendors regarding OEM arrangements. Likely partners include NCR Corp., DEC and Unisys Corp., among others.

While it is somewhat surprising that the creator of Unix has not yet offered a Unix fault-tolerant system, AT&T has not ignored this market. Among the products to be announced in early 1987, of particular interest is a project code-named Apache, a multiprocessor system providing both parallel and redundant processing. The system is based on AT&T's totally redundant 3B20D, which is currently used in a switch as more of a controller than a computer.

Although Apache has been "about to be announced" for nearly two years, sources at AT&T indicate that the market will finally have a chance to see the machine. AT&T says it believes that the fault-tolerant market is just waiting to be addressed, finding that even customers without the appropriate need are asking about fault tolerance.

The Unix fault-tolerant mart is in a fledgling stage, not too far behind the overall fault-tolerant market. Growth in the Unix segment will far outpace the proprietary operating system segment, fueled both by users and by vendors. The U.S. government may be one of the major forces in this arena with a high percentage of its request for proposal criteria now specifying Unix fault-tolerant systems.

New entrants to the fault-tolerant market have chosen Unix because they cannot afford to develop a proprietary operating system and want to take advantage both of the vast pool of Unix talent and the instant recognition and credibility of a brand name.

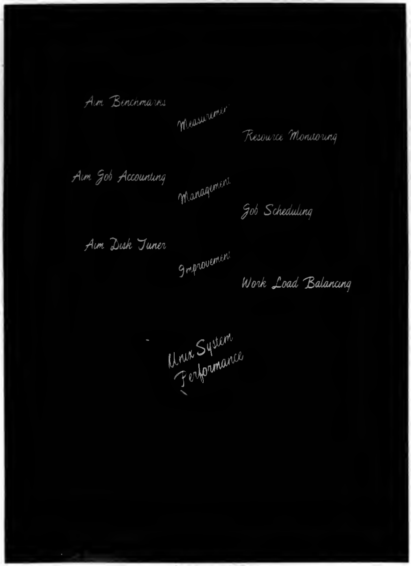
Large vendors as OEMs

As the market gains momentum, the large computer vendors will increase their participation either by developing their own machines, by acting as OEMs for smaller fault-tolerant vendors' products or even by acquiring the smaller vendors. As it is unlikely that many of the large vendors will act as OEMs for the same machine (such as Stratus's or Tandem's), the smaller Unix vendors will have the chance to deal with the big players. With the probable exception of IBM, those large vendors that elect to develop a fault-tolerant system internally will choose Unix for the operating system to avoid adding another proprietary operating system and to address user demand for Unix.

While some of the current small players will benefit from the consolidation, in the long term, the small vendors will either be squeezed out of or absorbed into the Unix fault-tolerant mart.

Gregory M. Avis, vice-president of Summit Ventures, a Boston-based venture capital firm, concurs. "Although the demand for fault-tolerant Unix systems is increasing rapidly, frankly, we don't see many attractive opportunities for investing in the new fault-tolerant Unix vendors. We believe the large computer vendors, either on their own or in conjunction with the existing small fault-tolerant vendors, will dominate this market."

Lovett is a principal of Avenir Associates, a Boston-based marketing consulting firm specializing in high-technology and financial services markets.



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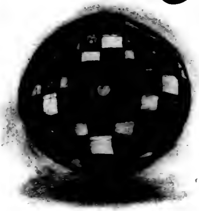
SPECIAL SECTION: UNIX

Multiprocessing Unix Meets Users' Needs



DAVE RIDLEY

·BY·REBECCA·HURST·

A group of multiprocessor Unix computer users is a lot like a patchwork quilt. Separately, the pieces bear little resemblance to each other, but together, they form patterns.

This variety stems from the many different purposes that multiprocessor computers can serve. Some multiprocessor machines are designed as fault-tolerant systems in which the multiple processors perform redundant tasks. Others are parallel computers that execute different programs or parts of a program simultaneously.

Fault-tolerant systems are often employed in matters of life and money. The most common use of these systems is on-line transaction processing (OLTP) in banks, but other businesses that need fault-tolerant OLTP computers include those in the gaming and wagering market. These multiprocessor systems are also essential for critical applications in such areas as manned space flights, hospitals and emergency service dispatches.

Parallel processing computers are built for speed. The users who purchase these systems are often technical researchers and developers looking for a faster way to run their software. Parallel computers also offer developers greater flexibility in their program design because users can write code that is optimized for running in parallel or sequential order.

Technical experts are not the only users of parallel computers, though. Some general-purpose computer users are choosing multiprocessor systems over conventional minicomputers because even sequential applications can be distributed across several processors. The result, users say, is a marked increase in price/performance over the minis.

Many multiprocessing computers introduced in the past few years, both parallel processing and fault tolerant, run the Unix operating system. The issue of Unix, in fact, has been largely a concern for multiprocessor vendors. For them, Unix is part of a broader decision to base their entire systems on such industry standards as microprocessors from Motorola, Inc. and National Semiconductor Corp. as well as Ethernet and Intel Corp. Multibus. The advantages the manufacturers see are lower development and production costs and flexibility.

As a result, many users end up with Unix almost by default. Among businesses that require the specific functions of a parallel or fault-tolerant computer, Unix is simply the operating system that comes with the machine. Other users purchase their computers as part of a turnkey system. For them, the applications are critical, and they may not even be aware of the operating system.

Those users who do seek a Unix-based multiprocessor system commonly give one of two reasons. Some users want to preserve applications already running on Unix. Other, first-time Unix users state that they had to rewrite several applications for a new computer system and chose Unix in order to avoid rewriting their software in the future.

The multiprocessor Unix users who recently spoke with *Computerworld Focus* came from the lottery business, an animal toxic control cênter and computing research labs. Together, they reflect the variety of purposes and reasons for choosing fault-tolerant or parallel processing systems. They also point out the relative importance of Unix in different applications.

Much like banks, companies that provide lottery services rely heavily on fault-tolerant OLTP. They face a credibility loss among their customers and heavy financial penalities should their systems fail. For example, a lottery supplier could be fined $10,000 for every minute of downtime, says Steven Greenfield, vice-president of on-line systems for Scientific Games, Inc. "We're required to carry liability limits of up to $25 million," he adds.

Scientific Games, based in Norcross, Ga., is a wholly owned subsidiary of Bally Manufacturing Corp. and the leading supplier of lottery products in the U.S., Greenfield says. The 11-year-old firm provides a variety of lottery-related services for 17 of the 22 states that currently run lotteries. It helps states pass legislation permitting lotteries and helps set up their lottery systems. Scientific Games also provides turnkey systems based on fault-tolerant computers, software to handle accounting and lottery validation and facilities management for the turnkey systems.

Scientific Games uses a combination of fault-tolerant computers from Parallel Computers, Inc. and Stratus Computer, Inc. The lottery company has 12 to 14 Stratus XA600 computers running VOS, Stratus's proprietary operating system, and between 16 and 20 Parallel Computer 300XR systems running Unix.

For Scientific, operating systems take a backseat to the hardware, Greenfield reports. "We were more concerned with the box than we were with the operating system," he says. "We wanted a box that was fault tolerant." The firm also needed systems that could operate in real time. "We have thousands of terminals for placing bets, and we can't keep them waiting," Greenfield explains.

State governments generally specify in requests for proposals (RFP) response rates that can best be met by high-speed, fault-tolerant computers. "They usually request that the systems handle 2,000 transactions per second," he says, "and each computer in the system has to have minimum transaction rates of about 100 to 200 transactions per second."

States further stipulate that the computer system handle every transaction that come in within 4 seconds, Greenfield adds. Finally, to ensure that the systems work reliably, state governments enact stiff penalties for computers that fail.

By contrast, states do not specify a particular operating system in their RFPs, and Scientific Computers writes applications in several languages including Cobol, Fortran, Pascal, PL/I and C. "For the Parallel computer, which runs Unix, we wrote software in the language most native to that system — C," Greenfield explains. "For the Stratus machine, we wrote our applications in Cobol."

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> *Fault-tolerant systems are often employed in matters of life and money.*

The operating system is not an issue, agrees Paul Pickering, data processing manager for the West Virginia Lottery, located in Charleston, W. Va. The state lottery uses both Stratus and Parallel computers. "I'm not really familiar with Unix," Pickering notes. However, he says, "We don't have to worry about the operating system because Scientific Games provides the applications."

While writing applications for the two computers was not a problem, Scientific Games had to create custom communications to connect the Stratus and Parallel systems. "The Parallel computer had Ethernet, but the Stratus [one] didn't," Greenfield explains. To make the computers communicate across Ethernet, Scientific Games wrote communications software for Ethernet and built Ethernet controllers into the Stratus computer. Additionally, to maintain fault tolerance across the network, the company provides redundant Ethernet systems in all its computers. In their final configurations, both computers are meeting Scientific Games's needs, Greenfield says.

The University of Illinois Urbana-Champaign National Animal Poison Control Center is not a transaction-intensive environment in the financial sense. Nor is it a high-tech computerized research lab. Instead, the veterinary organization depends on data base information stored on a Sequent Computer, Inc. multiprocessor system to identify and evaluate toxic substances in animals.

The poison control center was the first one of its kind in the nation from 1978 to 1986. By 1985, the center was handling 14,000 calls annually; in 1986, that number grew to almost 22,000, according to Harold Trammel, the center's associate director. Each call becomes a record in the data base, which is based on Informix Software, Inc.'s Informix-SQL. Each record uses roughly a kilobyte of memory, he says.

Originally, the center used an Altos Computer, Inc. 586 microcomputer with a 40M-byte internal drive and another 40M-byte external drive to hold the Informix data base. However, as the veterinary office began putting in the data, Trammel recalls, "the Altos computer's limitations and reliability problems reared their ugly heads." Eventually, the center found itself running reports and entering data separately.

The center clearly needed a more powerful computer, but the overriding purchase decision factor was not power — it was Unix. "We had no desire to go with anything other than Unix," Trammel reports. "We like the portability of the applications and having the shell command language."

The veterinary center began looking at the AT&T 3B2 and Digital Equipment Corp. VAX, but it eventually settled on a Pyramid Technology Corp. minicomputer as the Unix machine with the best price/performance, Trammel says. But, when he contacted the university's Computing Services Office about the Pyramid, the staff there recommended Sequent's Balance minicomputer.

After several months, the poison control center decided to purchase a Balance system. Trammel recalls, "The computing services office had a Balance system up for 18 months and had not had problems." The issue of money also contributed to the decision. "We could afford a used Pyramid computer, or we could get a new Balance system for not a lot more," he notes.

The poison control center installed a six-CPU Balance system with between 6M and 8M bytes of memory and 800M bytes of storage. "A smaller Sequent machine could have met our immediate needs," Trammel admits. However, the memory of expanding the Altos 586 to its limits is still clear. "We want a system that will meet our needs in two years," he says. And if it doesn't, the present system has room for six additional processors, more internal memory and several hard drives. "We don't see ourselves getting boxed in with this system," Trammel explains.

Texas is the home of the Microelectronics and Computer Technology Corp. (MCC) and the National Aeronautics and Space Administration's Johnson Space Center, two organizations performing leading research in parallel applications.

Both are looking for faster ways to call up information and make decisions using computer systems. For them, speed is the motivating factor for purchasing parallel processing computers from Flexible Computer Corp. located in Dallas.

Developing a parallel data base is one charter of MCC, a consortium for cooperative research on behalf of shareholder companies, according to Gene Lowenthal, vice-president of programming. There are 21 shareholders in all, including such companies as Honeywell, Inc. and Control Data Corp., that will use the technology developed at the facility in their commercial products.

MCC is using a Flexible Flex/32 computer with 40 Motorola 68020 processors, each with an associated hard disk. This system is being used by researchers both to run experimental software and to see how parallel machines are designed, Lowenthal explains.

The researchers expect the hardware to play an integral role in their data base solution. "We're looking at the software data base system in terms of replacing the software with a hardware combination that executes commands in parallel," Lowenthal says. As such, the Flex/32 not only contributes to the research, it is a part of it.

Although researchers have been developing experimental software that runs on Unix, that operating system will not be part of the data base solution, Lowenthal asserts. "Ultimately, we expect to have a dedicated operating system optimized for the particular data base software executed on the system," he says.

As at MCC, the Johnson Space Center did not consider Unix as an important decision purchase factor in its research. "Our requirement is simply that the operating system be robust enough for our development work," explains Gary Riley, a NASA aerospace engineer. "The question we had was what *hardware* approach the designers took with the computer."

At the NASA artificial intelligence laboratory, a six-processor Flex/32 computer is being used to develop expert system software. "We've used the Flex/32 to develop an expert system shell — a high-order language built on top of C," Riley says. Using the shell, researchers will then develop expert systems that can work on a variety of computers, not just those based on Unix.

The purpose of the resulting expert systems will be to help NASA plan and control manned space missions similar to its *Apollo*, Skylab and space shuttle flights.

By using a parallel computer such as the Flex/32, researchers hope to overcome some of the inherent limitations of conventional sequential computers. "For example," Riley says, "an engineer may have thousands of pieces of data and may want to perform the same 100 operations nn each." A Cray Research, Inc. computer could run each operation quickly, but it would still run them sequentially, Riley notes. A parallel processor can cut down runtime by handling several of the processes simultaneously.

The theory of multiprocessing

Theoretically, the more processors there are running simultaneously, the faster and more efficiently a computer can run applications. This is the idea behind the Connection Machine from Thinking Machines, Inc., a computer that figures prominently on Riley's wish list.

Reportedly, the Connection Machine has 64,000 1-bit processors and can emulate up to 250,000 processors through software. The computer is fast and allows programmers to write very simple programs to handle large tasks.

"The Flex/32 comes a lot closer to conventional thinking," Riley says. The computer can split a program across six processors. "From then on, each processor thinks it's sequential until the pieces get back together and decide what they did." But, he adds, "Six is enough for us to figure out if what we're doing is working." ■

Hurst is a Computerworld Focus *senior writer.*

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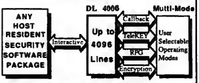
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CIRCLE READER SERVICE NUMBER 223

SYSTEMS UPDATE

Secrets Of Survival For Alternate Systems

•BY•MICHAEL•TUCKER•

OK, all the operating system questions are answered, right? We know now that basically there are only a couple of operating systems in the whole wide world. Things have pretty much boiled down to AT&T Unix System V, or one of IBM's systems or maybe one of the proprietary solutions. That's it. The whole ball of wax. Right?

Wrong.

For some MIS departments, operating systems remain very much an open question with several answers. Alternatives to Unix, IBM and proprietary behemoths have retained both users and market position. Indeed, in combination with the new, 32-bit microcomputers, these other operating systems could become the most important weapons by which MIS finally gains control of personal computers.

Consider Pick, from Pick Systems headquartered in Irvine, Calif. Pick is the brainchild of the colorful Richard Pick, who put down the foundations of his system with colleague Don Nelson during the late 1960s when the two men had been asked to develop a data management facility for the U.S. Army. Intrigued by the problems of information management, Pick decided to create an operating system that would take data management as one of its underlying principles, rather in the same way that University of California at Berkeley Unix 4.2 assumes as a given that it will be used for software development.

The result, by the early 1970s, was the Pick System, an operating system tailor-made for multiuser business applications. It is a simple, direct and focused system; it is meant for the business user, not the programmer. The Pick System offers a built-in data base, a built-in programming language (a Basic variant with an English-like vocabulary and syntax) and an almost fanatic degree of standardization.

Where Unix was a committee effort and so is only now achieving some level of standardization, Pick is the creation of an individual, and Pick, the man, has fought to give Pick, the system, a level of purity unmatched in operating systems. Every one of the estimated 25,000 authorized installed minicomputer and mainframe Pick installations and the unknown number of Pick-based IBM Personal Computer installations look pretty much the same to both programmers and applications.

For a brief period in the 1970s, it seemed that Pick would emerge as *the* generic operating system for business applications. It was widely remarketed under various names as the operating system in several brands of minis — for instance, Microdata, now McDonnell Douglas Computer Systems Co., located in Irvine, packaged it under the name Reality. In the process, Pick became the darling of those value-added resellers that were depending on minis to get their products to market. This passionate affair was blessed with issue on a grand scale, and the number of vertical market applications running on Pick now exceeds 3,000. Perhaps only Microsoft Corp.'s MS-DOS can boast a more energetic following of independent software developers.

Perhaps the fact that Pick did not become the MIS standard was an accident or a mugging of history. The system was sandbagged from two directions. On the technological side, the microcomputer boom in the late 1970s and early 1980s seriously damaged Pick's traditional, mini-based market. Fortunately for Pick, its vendor was able to address this issue, and an IBM Personal Computer XT version of the operating system appeared by 1984.

Less easy to combat was the marketing side of Pick's problems. After years of relative inactivity, Unix abruptly emerged from its university labs as a "commercial" product in the early 1980s. If software were sold on technical merit alone, Pick probably could have met the Unix threat with relatively little loss of blood. But, Unix's history and widespread university use made Unix tremendously popular with programmers. Unix had an elan that Pick could not match.

More importantly, Unix had as its patron AT&T, one of the most powerful corporations in the world; Pick could claim only Pick Systems and a handful of users.

The low point for Pick came somewhere around 1983. Analysts and trade journalists were seriously discussing its demise. The best Pick could hope for, the pundits said, was a sort of living death. Perhaps historians would keep Pick source code about as a museum case example of a loser in a great Darwinian competition.

By 1985, it was clear that Pick was anything but extinct. Upgrades of the product had produced true multitasking versions, and it had been ported to still more microcomputers and even some mainframes. A Pick users group, the Spectrum Manufacturers Association, had been formed, and its members included such industry heavyweights as General Automation, Inc., Fujitsu America, Inc., Nixdorf Computer Corp., Prime

CLIF GARBODEN STOCK, BOSTON, INC

A Dedicated User Community May Be The Secret Of CP/M's Power

CP/M from Digital Research, Inc. of Monterey, Calif., was the first great generic operating system for personal computers. For a brief time, it seemed as though CP/M would be dominant in the single-user field forever. Then, IBM lowered the Microsoft Corp. MS-DOS curtain on the industry, and Digital Research hasn't been the same since.

But CP/M remains. It has grown, been diversified into a family of operating systems, become MS-DOS compatible and cultivated users.

There is a multitasking version called Concurrent DOS that gives users of the IBM Personal Computer and compatibles the ability to run up to four applications at the same time.

Originally for 286-based units

Concurrent DOS was, in fact, originally advertised as an operating system for the Intel Corp. 80286-based systems, which means that it was designed for the same marketplace that Microsoft is only now addressing with its 286DOS.

Concurrent DOS has not been able to claim the major share of the 80286 operating system that Digital Research would have liked. However, CP/M's real power may exist with its users. Since its introduction, the operating system has maintained a dedicated following among programmers who point out that the theoretically more powerful MS-DOS is actually slower and less fully featured than CP/M Release 1 for some tasks.

As 80386-based machines come to the fore, this large user community could be important. It was the existence of a very similar community of hackers, trained on Unix-based university systems, who made it possible for Unix to become a successful commerical product in the 1980s.

— Michael Tucker

Computer, Inc. and Ultimate Corp.

Pick Systems, meanwhile, was looking forward to a comfortable and interesting future in the new, 32-bit multiuser microcomputer, which made desktop machines look like the old-time minis that had been Pick's meat and drink.

Why had Pick survived? Mostly because Pick users had weighed other solutions and found them wanting. "Unix is simply not a business operating system," says Phil Gerber, MIS director for Norm Thompson, a direct mail firm based in Portland, Ore. "It wasn't designed to be one. Pick was. It's meant for interactive, people-oriented things."

Gerber also has limited patience with IBM systems. "It's been my general experience that IBM can do anything if you've got enough money and people to throw at the problem. We're doing a lot with very little. Our choice of Pick was a question of value."

Norm Thompson performs all of its data processing on two 16-bit computers from Ultimate, located in East Hanover, N.J. One machine is supporting 68 ports while the other supports 58. "We've got all our resources integrated through Pick. We do accounting, run spreadsheets, do financial modeling [and] maintain our customer mailing list."

Gerber is considering the purchase of a third Pick-based system, possibly another 16-bit Ultimate machine. However, Ultimate offers Pick on a number of different computers. Ultimate is an OEM vendor, purchasing hardware from several sources and configuring it for its own enhanced version of Pick called Ultimate. The newest of these, and the one that may say the most about Pick's future, is the Series 7000, a 32-bit system based on Honeywell, Inc. hardware. The largest Ultimate version is the 9000 series — a Pick implemention for IBM 370 architecture machines.

A Theosophical society

At this point, poor, harrassed MIS officers usually ask something like the following: "But, if larger machines cannot be counted on for simple choices when it comes to operating systems, surely, microcomputers can be. Surely, for micros, the options boil down to one vendor — Microsoft of Bellevue, Wash. — and three products — Microsoft's MS-DOS and Xenix and IBM's PC-DOS version."

Actually, things are a bit more complex than that. The microcomputer world swarms with operating systems. And, worse, there are times when MIS cannot avoid looking at some of them.

Even before the introduction of the IBM PC and the gradual standardization of the market around it, business users had found that existing operating systems did not meet their needs. For one thing, most of the PC operating systems assumed that PCs would indeed be personal — that is, single-user systems.

In fact, for organizations doing such things as low-level data entry or forms management, single-user systems were not what was wanted. For them what made sense was a very inexpensive multiuser system. The most cost-efficient path to such systems was often to purchase the cheapest possible machine (that is, a PC) and turn that into a small-group multiuser system via dumb terminals. This depersonalized PC could provide the necessary computer-powered boost in productivity and a gateway into the corporate mainframe as well.

Developers plunged into the work group operating system market. One of the first vendors into the pool was a company now called Theos Software Corp. of Lafayette, Calif. As early as 1978, Theos Chairman Tim Williams wrote and marketed the Oasis operating system, which turned Zilog Corp. Z-80 machines into two- to three-user systems. Oasis gradually dried up with the demise of the Z-80 market, but by then the IBM PC had appeared. Williams and his staff retooled Oasis for the PC and renamed it The Operating System, or Theos.

By 1985, Theos was far more than just an average work group operating system. It was shaping up as a competitor to both Xenix and the various DOS systems as the operating system of choice on the new multiuser microcomputers. Theos 86 runs on such Intel Corp. 8086-8088- and 80186-based machines as the IBM PC AT and the Altos 586 from Altos Computer Systems, Inc. Theos 286-V, announced in 1986, runs on all Intel 80286-based machines and supports up to 32 users. It provides MS-DOS emulation as well, meaning that in addition to the 500 to 600 Theos applications already on the the market, Theos-based machines will be able to exploit the huge software library of the IBM PC. Theos also has the advantage of being a very simple, very low-maintanence operating system.

One company exploiting those aspects is Shoreman Food Technologies, a manufacturer of dehydrated carbohydrate fractions for major food companies, which has used Theos on an assortment of machines in MIS operations for almost a decade.

Shoreman's President, Elon L. Bateman, first came to the company as its controller, and he was responsible for the choice of what was then Oasis as the firm's operating system. Originally, Shoreman was using an operating system the firm had written itself, but, Bateman says, "We realized we'd gotten to the point that we needed a system that didn't have to have a specialist to come and burp it every time something went wrong." After shopping around, he settled on Theos. "'I'm doing accounting and business functions. I need tools to do that. I need things like ISAM files. Theos provides those tools, as well as a resident Basic."

Currently, Shoreman does most of its computer work on a supermicrocomputer from Third Coast Technologies, headquartered in Foster City, Calif., a vendor that specializes in multiuser Theos-based systems. Bateman explains his loyality to Theos: "It's a very easy system to work with, particularly for nontechnical people. . . . For instance, your chances of destroying the system are just about nil. It always assumes you may not know exactly what you're doing at all times. Unix assumes you're always an expert."

So, nothing is safe in the operating system world. Just when you thought that all the operating system choices were made, other options come popping out of the woodwork.

But, just because the options are there, does that mean that MIS officers should take them? After all, industry-standard operating systems already provide most of everything MIS wants for its existing machines.

However, the operative phrase here is "existing machines." Pick, Theos and other alternatives are not aiming for existing machines.

As usual, the real cause of all the fuss is the microcomputer. A glance at the history of both Pick and Theos reveals an interesting pattern. Both got their start in an earlier day of computing, before the current rage for standardization had begun. Both suffered when MS-DOS-based, 16-bit computers replaced their existing markets — Pick's minis and Theos's Zilog-based micros. Both are now suddenly active in the micro market.

Why are they active again? Perhaps because once more micros are on the move. Indeed, the machines are evolving so quickly that traditional micro operating systems, such as Xenix and MS-DOS, may or may not be able to keep pace with them. Even the newest and most powerful of the advanced Microsoft MS-DOS systems, the sophisticated 286DOS, is meant for machines based on the 80286 processor, not the more recently introduced 32-bit Intel 80386 chip.

Yet, computers built on the 386 and other 32-bit processors are already on the market, and more are coming. MIS is now being called upon to decide how an entirely new order of micros can be integrated into larger corporate strategies at a time when not even the former generation of 16-bit micros has successfully been digested and when the standard operating system for 32-bit machines has not yet been clearly established.

The alternative operating systems are thus taking a shot at an entirely new class of machine, not competing with existing mainframe and microcomputer products. The recent major introductions of both Pick and Theos have been for 32-bit or 16/32 bit computers.

Operating System War II

It may be that the computer industry is about to enter an age of operating system wars, rather like the early 1980s when Digital Research, Inc. CP/M squared off with MS-DOS in a titantic struggle for the future of the personal computer. If so, then operating systems that seem like exotica today may have a real chance of winning the emerging multiuser micro market — operating systems, like Pick, that have brought multiuser and multitasking functionality down from minicomputers or systems like Theos that have added this functionality to existing 16-bit systems.

This movement could be important to MIS directors. Industry observers have already suggested that 32-bit systems will be increasingly used to manage the large number of PCs already on end users' desks. If MIS professionals become the managers of these multiuser micros, then such machines may return to MIS some of the control of technology that it has lost to micro managers, chief information officers and end users.

But, for MIS people to gain control of the machines, they will have to participate in the debate about which operating systems will become the multiuser micro standard.

Of course, the systems with the best chance of winning in the 32-bit world are Xenix or some future 386 DOS. Yet, sure bets are not always winners. Perhaps, in this race, a dark horse like Pick or Theos could take all. ■

Tucker is Computerworld Focus *features editor.*

Create A Custom Operating System

There are times when no operating system available on the open market meets your needs and you have to write one of your own.

Should such a grisly fate be yours, help is available. One company, Wendin, Inc. of Cheney, Wash., markets the O/S Tookit for IBM Personal Computers and compatibles. O/S Toolkit is a library of source code on two floppy disks. With it, even relatively unsophisticated programmers can produce custom operating systems with a few weeks work.

Wendin itself has already used O/S Toolkit to produce two operating systems that it markets: PCUnix, a Unix-like system for microcomputers, and PCVMS, a Digitial Equipment Corp. VMS work-alike.

O/S Toolkit is priced at $99.00.

— Michael Tucker

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SOFTWARE PRODUCTS

DEC Extends Vaxcluster

Treats Vaxstation, Microvax As Unit

MAYNARD, Mass. — Digital Equipment Corp. has introduced Local Area Vaxcluster Systems, which, through the use of Ethernet baseband networking, integrate Microvax II and Vaxstation II systems into a single computing environment and extend Vaxcluster capabilities to the work group.

DEC said its Local Area Vaxcluster System software enables the connection of up to 13 Vaxstation II or Microvax client systems to a central Microvax or VAX server. The server or central Microvax, in turn, manages the system software, all software applications and a shared common file system.

According to DEC, the Local Area Vaxcluster Systems allow participating systems to act as a single unit, sharing resources, such as disks, tapes and printers, while using a single, distributed file system and maintaining the independence of each processor.

System manager functions

A system manager reportedly can perform the necessary management functions for all members of the Local Area Vaxcluster Systems, eliminating management tasks for client users.

As a result, DEC claimed, users of the company's All-In-1 integrated office system, the Vaxset integrated software development environment and the EDCS engineering information management system will notice marked improvement in productivity when using these products with the Local Area Vaxcluster Systems.

Local Area Vaxcluster Systems software is priced at $1,000 on the Vaxstation, $1,900 on the Microvax II and $9,500 on the VAX 8800.

New hardware configurations

DEC also introduced three Microvax II and two Vaxstation configurations to work with Local Area Vaxcluster Systems.

According to DEC, the computers and workstations will extend shared data and distributed computing capabilities.

The Vaxstation II configurations range in price from $19,900 to $23,900. The Microvax II configurations are priced from $19,900 for a diskless/tapeless system to $94,855 for a preconfigured Local Area Vaxcluster server complete with DEC's VMS operating system, Decnet/Ethernet networking and the Local Area Vaxcluster Systems software licenses.

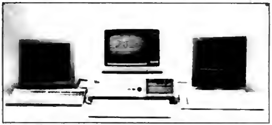
For further information, contact Digital Equipment Corp., 111 Powdermill Road, Maynard, Mass. 01754.

Circle Reader Service Number 301

Locus Adds Merge 386 To Line

SANTA MONICA, Calif. — Locus Computing Corp. has added Merge 386 to its line of Merge operating environment products, which include Merge 286 and AT&T's Simul-Task for the AT&T Personal Computer 6300 Plus.

Merge 386 allows an Intel Corp. 80386-based computer to run both Unix and Microsoft Corp. MS-DOS concurrently using either MS-DOS or Unix commands that the user has input directly from the system prompt.


Merge 386 allows a 386-based unit to run MS-DOS and Unix concurrently.

When a user enters a command, Merge 386 determines whether the command is Unix or MS-DOS. If it is a valid Unix command, it is executed by Unix. However, if :he command is MS-DOS, the Merge 386 software creates a Virtual 86 environment and executes the MS-DOS application program within it.

In the Merge 386 product, MS-DOS runs as a task under Unix, so users can execute several MS-DOS and Unix tasks simultaneously. Because Merge 386 contains a full-implementation MS-DOS, almost all MS-DOS and PC-DOS programs will run on it without modification.

Merge 386 will be available in the first quarter of 1987 for MS-DOS and PC-

application program within it.

lease 3.0. It requires an Intel 80386-based computer, with 1M byte of random-access memory. Merge 386 is expected to cost less than $500.

For further information, contact Locus Computing Corp., 3330 Ocean Park Blvd., Santa Monica, Calif. 90405.

Circle Reader Service Number 302

Oracle Interface Directs SQL Users

BELMONT, Calif. — Oracle Corp. announced Easy SQL, an interface designed for Oracle data base management system users unfamiliar with IBM's SQL.

Easy SQL includes pop-up windows, function keys, flexible menus, automatic hints and context-sensitive Help. In addition to ad hoc relational query capabilities, Easy SQL provides facilities for writing reports, using color graphics, creating data base tables and performing maintenance.

The output of the user queries is normally directed to the user's screen, but users can redirect the output to standard personal computer data file formats. To exchange information outside the data base, Easy SQL incorporates Oracle's Easy Link micro-to-mainframe link and it provides menus that let users access other Oracle programs such as SQL Calc.

Two key features, according to company spokesmen, are a query preview facility and color graphics. Easy SQL's preview facility allows the user to press a key that opens up a window and displays up to five records to satisfy the user's query. The interface's graph facility lets users directly graph the contents of the data base using bar, pie and line charts with colors, patterns, labels and axis scales that the user defines.

Easy SQL works on IBM Personal Computers running PC-DOS and the Oracle DBMS. It is sold separately for $395 or with Oracle for $995.

For further information, contact Oracle Corp., 20 Davis Drive, Belmont, Calif. 94002.

Circle Reader Service Number 303

Gold Hill LISP Out For PC Expert Applications

CAMBRIDGE, Mass. — Gold Hill Computers, Inc. has introduced its LISP System for developing large expert systems applications on microcomputers.

The LISP System has two components: the Hummingboard, a 6M-byte, plug-in board based on the Intel Corp. 32-bit 80386 microprocessor running at 16 MHz, for IBM Personal Computer XTs and Personal Computer ATs; and the Golden Common LISP (GCLISP) 80386 Developer.

The firm said the Hummingboard serves as a coprocessor capable of executing GCLISP programs five times faster than an IBM PC AT. The system shares memory with the base processor in accordance with the Intel/Lotus/Microsoft Expanded Memory Specification, enabling standard micro applications to take advantage of the extra memory available.

The Hummingboard's directly addressable on-board memory will be expandable to 24M bytes with the availability of 1M-byte dynamic random-access memory (RAM) chips.

According to the company, the 32-byte memory data paths and 12K-byte line high-speed cache memory yield a processor/memory cycle time comparable with that of superminicomputers.

Gold Hill added that the GCLISP 386 Developer includes a large memory interpreter and compiler, editor, tutorial and on-line Help system. The GCLISP Developer also supports lexical scoping, packages and transcendental functions.

LISP System costs $7,000 and includes the Hummingboard with 6M bytes of RAM and the GCLISP Developer.

For more information, contact Gold Hill Computers, Inc., 163 Harvard St., Cambridge, Mass. 02139.

Circle Reader Service Number 304

Microsoft Unveils Xenix 386, Xenix 286 Upgrade Kit

REDMOND, Wash. — Microsoft Corp. introduced the Xenix System V/386 operating system and the Xenix System V/386 Toolkit, an upgrade package for Microsoft Xenix System V/286.

Like Xenix System V/286, Xenix 386 is multiuser, multitasking operating system that fully complies with AT&T's Unix System V Interface Definition.

The full Xenix implementation will utilize all the capabilities of the Intel Corp. 80386 chip, Microsoft reported.

Virtual address space of 4G bytes

These abilities include the provision of a 4G-byte virtual address space, use of the full 32-bit instruction set and support for virtual memory and demand paging.

Xenix 386 is scheduled for availability in the first quarter of this year.

Pricing for Xenix 386, including the operating system, C language compiler, macro assembler and writing utility, will be approximately $1,000.

Microsoft also introduced the Xenix System V/386 Toolkit to allow independent software developers to begin developing Xenix 386 applications before the release of Xenix 386.

The Toolkit consists of program development tools to create Xenix 386 applications, the execution environment for running them and a modified version of the Xenix 286 documentation.

Development tools include a Microsoft C compiler for the 80386 and an extended version of Microsoft Macro Assembler that supports the 80386 instruction set and addressing modes as well as a debugger for 386 programs, according to a spokesman.

Toolkit requires Xenix 286

The program development tools in the Toolkit can be installed on any computer running Xenix 286, however, the execution environment requires an 80386-based system with Xenix 286.

Programs built with the Toolkit can run on any IBM Personal Computer AT or compatible equipped with an 80386 processor.

The Toolkit is available immediately for a price of $395.

For further information, contact Microsoft Corp., Box 97017, Redmond, Wash. 98073.

Circle Reader Service Number 305

Convergent Technologies Announces The 386 Ngen Workstation

SAN JOSE, Calif. — Convergent Technologies, Inc. has introduced the Series 386 Ngen workstation, which the company said provides concurrent access to application bases developed for multiple operating systems.

The Series 386 pairs Convergent's CTOS/VM network operating system and the Intel Corp. 80386 microprocessor. In addition to CTOS/VM, the Series 386 runs AT&T's Unix System V and Microsoft Corp.'s MS-DOS operating systems, allowing users to utilize the base of applications written for these operating systems.

The 386 Ngen runs multiple operating systems and provides multitasking capabilities, enabling users to simultaneously run programs such as Lotus Development Corp. 1-2-3 and Microsoft Multiplan spreadsheets.

Two models available

The Series 386 Ngen comes in two models: the CP-003 with a 16-MHz Intel 80386 processor and the CP-003/287 equipped with a 16-MHz 80386 and a 10-MHz Intel 80287 math coprocessor. A basic system comes with 1M byte of random-access memory (RAM) expandable to 4M bytes of RAM in 512K-byte or 1M-byte increments; I/O support for two RS-232C ports; parallel printer port; and RS-422 operations at speeds up to 1.8M bit/sec.

Convergent's CTOS II operating system is a distributed network, real-time, multitasking system. The company added that CTOS II runs applications written for the IBM Personal Computers and compatibles.

Convergent said a base 386 Ngen system configured with 1M byte of RAM, a 20M-byte hard disk and floppy disk is priced for sale to OEMs at between $8,700 and $9,000.

For further information, contact Convergent Technologies, Inc., 2700 N. First St., San Jose, Calif. 95150.

Circle Reader Service Number 306

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CIRCLE READER SERVICE NUMBER 217

Lotus Unveils Updated Freelance Plus

CAMBRIDGE, Mass. — Lotus Development Corp. announced Lotus Freelance Plus, an upgraded version of the Lotus Freelance graphics package acquired from Graphic Communications, Inc. Freelance Plus builds on Freelance's core of graphics modules, including charting, chart editing diagrams, word charts, freehand drawing, symbols and maps, with two new modules and enhanced capabilities.

Enhancements to Freelance's existing core capabilities include more powerful freehand drawing; fill patterns that show gray scales when printing in black and white; and expanded file export capabilities that allow users to incorporate Freelance Plus graphics into documents created with word processing or desktop publishing packages.

Freelance Plus is immediately available for $495. Registered Freelance users can pay $100 and exhange their current packages for Freelance Plus.

Map sets debut

Lotus also introduced Freelance Maps, a collection of map sets designed to work with Freelance Plus and provide a complete library of map symbols. Freelance Maps includes four individual sets: Continents & Countries, U.S. Counties, U.S. 3-Digit ZIP Codes (a subset of the standard five-digit codes) and U.S. Major Cities and MSAs (metropolitan statistical areas) as well as the U.S. Complete Set.

Lotus's suggested retail prices are $145 for each of the individual sets and $395 for the U.S. Complete Set.

For further information, contact Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, Mass. 02142.

Circle Reader Service Number 307

SOFTWARE PRODUCTS

Multitasking PC Tool Bows

SANTA CLARA, Calif. — Softguard Systems, Inc. announced VM/386, a control program that brings multitasking to personal computers.

VM/386 takes an Intel Corp. 80386-based computer that is compatible with the IBM Personal Computer and sets up virtual machines inside the computer. VM/386 reportedly runs all existing PC and PC-compatible applications, including all Microsoft Corp. MS-DOS and single-user versions of Xenix.

The virtual machines run concurrently, and each thinks it has exclusive access to all the real computer's resources. Each virtual machine can have its own operating system as well.

Incorporates VM/370 features

VM/386 was written in 80386 assembly language by mainframe software developers who wanted to use IBM's VM/370 operating system concepts to bring features such as multitasking and record locking to 80386-based computers.

The advantages of writing in assembly includes better speed and less disk space, according to a spokesman.

VM/386 will be available in the second quarter of 1987 and will retail for less than $350. Discounts for OEM quantities are available.

For further information, contact Softguard Systems, Inc., Suite 201, 2840 San Tomas Expwy., Santa Clara, Calif. 95051.

Circle Reader Service Number 308

Micros Get Theos 386-Based Version

LAFAYETTE, Calif. — Theos Software Corp. has introduced a version of its Theos multiuser, multitasking operating system for the Intel Corp. 80386 microprocessor. The initial version of Theos 386 will address up to 16M bytes of random-access memory and support 32 users in a multiuser environment, the company claimed.

The company added that Theos 386 will offer the features of a mainframe operating environment for 80386-based microcomputers. An interface using built-in Help files instructs novice users about Theos commands, their functions and syntaxes.

Theos 386 is also complemented by Basic, C and assembly languages for software development. Theos Software claimed these languages feature a bridge enabling software developed under one microprocessor version of Theos to be translated and run under newer Theos versions, including Theos 386.

Theos 386 is initially available on the Ensign 386:100, an 80386-based system from Integrated Business Computers, Inc. of Chatsworth, Calif. Theos Software said other system implementations will be forthcoming. The operating system is separately priced at $895 per processor.

For further information, contact Theos Software Corp., Suite 100, 201 Lafayette Circle, Lafayette, Calif. 94549.

Circle Reader Service Number 309

Software Link Unveils PC-MOS/386 Pricing

ATLANTA — The Software Link, Inc. has announced pricing for PC-MOS/386, its multiuser operating system.

The company said PC-MOS/386 is available in three versions: the PC-MOS/386 MT single-user version, which is priced at $195 and provides concurrency for multiple applications; PC-MOS/386 Multiuser-5, which is priced at $595 and enables as many as five users to run applications at remote dumb terminals powered by a single Intel Corp. 80386 machine; and the PC-MOS/386 Multiuser-25, which is priced at $995 and lets up to 25 users run applications at dumb terminals.

Software Link said that all versions of PC-MOS/386 are Microsoft Corp. MS-DOS-compatible operating systems that support the four operating modes of the 80386 processor. Through support of the processor's real mode and virtual 8086 mode, the Software Link said that PC-MOS/386 will be compatible with all the existing base of MS-DOS application software.

Standard multitasking/multiuser features of PC-MOS/386 include support for record and file locking, intertask communications through the IBM Netbios protocol, print spooling, remote modem access, usage statistics, nested batch files and security at the user, file and directory levels.

Software Link added that applications that write directly to the video memory are intercepted by PC-MOS/386 and managed for users running multiple tasks or operating at remote terminals. According to the firm, PC-MOS/386 supports MS-DOS function calls while adding only a few extra functions to deal with memory management.

For further information, contact The Software Link, Inc., Suite 632, 8601 Dunwoody Place, N.E., Atlanta, Ga. 30338.

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CALENDAR

Jan. 12-14, Park City, Utah — **Competitive Technology Strategies of AT&T, the BOCs and IBM.** Also being held March 19-20, Chicago. Contact: Telestrategies, Inc., P.O. Box 811, McLean, Va. 22101.

Jan. 14-16, Dallas — **Data Administration and Data Resource Development.** Also being held April 27-29, New York. Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

Jan. 14-16, San Diego — **Computer Graphics '87.** Contact: Frost & Sullivan, Inc., 106 Fulton St., New York, N.Y. 10038.

Jan. 14-16, Washington, D.C. — **Telecommunications Management.** Contact: BCR Enterprises, 950 York Road, Hinsdale, Ill. 60521.

Jan. 22-23, Boston — **The IBM PC XT/AT & Compatibles: Maximizing Their Potential.** Also being held Jan. 29-30, Orlando, Fla.; Feb. 9-10, San Diego; and Feb. 26-27, Washington, D.C. Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

Jan. 28-30, New York — **Computer Graphics New York '87.** Contact: Exhibition Marketing & Management, Inc., Suite 690, 8300 Greensboro Drive, McLean, Va. 22102.

Jan. 28-31, San Francisco — **The Seybold Group's Conference on Desktop Communications.** Contact: The Seybold Group, Suite 132, 20695 Western Ave., Torrance, Calif. 90501.

Feb. 2-5, Dallas — **Software Trends for Executive Planning and Strategy.** Contact: Digital Consulting Associates, Inc., 6 Windsor St., Andover, Mass. 01810.

Feb. 3-5, San Francisco — **Data Base: A Manager's Guide.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

Feb. 4-6, San Francisco — **Data Networks: Management, Operation and Control.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

Feb. 5-6, Boston — **An Intensive Introduction to T1 Networking.** Also being held Feb. 9-10, Atlanta; Feb. 12-13, Detroit; and Feb. 19-20, Princeton, N.J. Contact: Data-Tech Institute, P.O. Box 2429, Lakeview Plaza, Clifton, N.J. 07015.

Feb. 9-10, Boston — **Fourth- and Fifth-Generation Data Management Software.** Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

Feb. 9-10, St. Louis — **Implementing Low-Cost CADD.** Also being held Feb. 12-13, Washington, D.C.; April 27-28, Cleveland; April 30 to May 1, Chicago; and June 11-12, Boston. Contact: National Computer Graphics Association, P.O. Box 3412, McLean, Va. 22103.

Feb. 9-11, Boston — **End-User Strategies: The Convergence of OA and the PC.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

Feb. 9-12, Washington D.C. — **Communication Networks Conference & Exposition.** Contact: Communication Networks, Box 9171, 375 Cochituate Road, Framingham, Mass. 01701.

Feb. 9-12, Chicago — **Supercomputers and AI Machines.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

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Applications Solutions	June 3	May 1	NCC
Software**	July 8	May 29	Siggraph
PC's	August 12	July 3	PC Expo
Communications	September 2	July 31	TCA & Info '87
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